THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

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GAS PURIFICATION
BY
OXIDE OF IRON.

COOKE BROS.,
CENTRAL DEPÔTS:
CO. DONEGAL, IRELAND;
LONDON DEPÔT:
BLACKWALL, E.;
OFFICES:
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GENUINE TORBAY
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RESISTS
SULPHURETTED HYDROGEN.
Does not Blister, Crack, or Flake off.
Has very large surfacing powers.
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BROOKFIELD GAS APPARATUS WORKS,
103, ICKNIELD STREET EAST, BIRMINGHAM.
CONTRACTOR FOR
LAYING MAINS
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Gas, Water, & Sanitary Purposes,
AND MANUFACTURER OF
WOOD GRIDS
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SCRUBBERS AND PURIFIERS.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a Prize Medal was awarded at the Great Exhibition of 1851, for "Gas-Retorts and other Objects in Fire-Clay," and they were also awarded at the International Exhibition of 1862, the Prize Medal for "Gas-Retorts, Fire-Bricks, &c., for Excellence of Quality."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
COWEN'S GARESFIELD COALS.
Jos. Cowen & Co. are the only Manufacturers of Fire-Bricks and Clay Retorts at Blaydon Burn.

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Established at the commencement of Gas Lighting,
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THREE PRIZE MEDALS,
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BELL BARN ROAD, BIRMINGHAM,
MANUFACTURERS OF
WET AND DRY GAS-METERS,
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PATENT COMPENSATING METERS,
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Established 1830.

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MANUFACTURERS OF
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
Sugar, Saltpetre, and all kinds of Pans.
Roofs, Girders, and Bridges, and General Smith's Work.
London Offices: 97, CANNON STREET—
JAMES E. & SAMUEL SPENCER, Agents.

THE
"OTTO" GAS-ENGINE.
See Advertisement in last week's JOURNAL, page 470.

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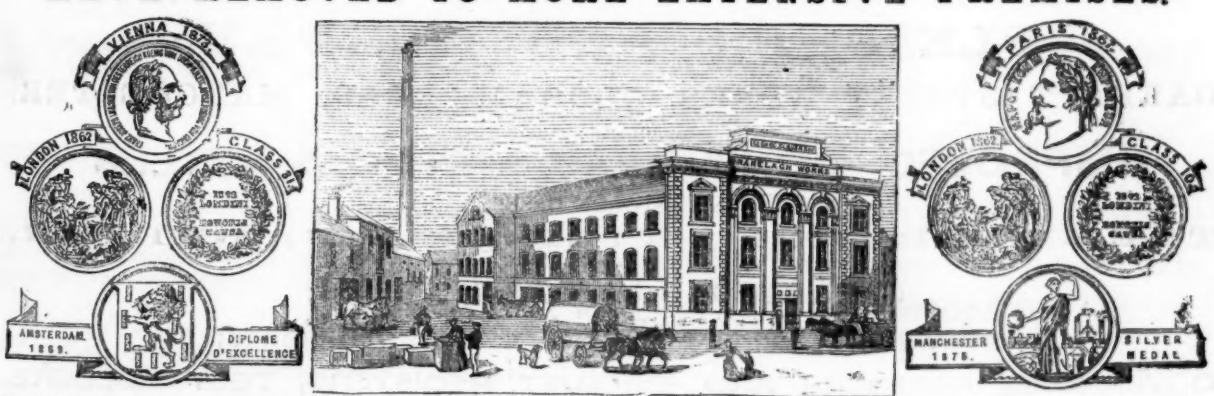
MANCHESTER AND LONDON.

THE
DUKE OF HAMILTON'S
LESMAHAGOW
CANNEL COAL.
AGENT:
JAMES M'KELVIE,
HAYMARKET,
EDINBURGH.
ESTABLISHED 1840.

CHANGE OF ADDRESS.
GEORGE GLOVER AND CO.,
DRY GAS-METER MANUFACTURERS,
HAVE REMOVED TO MORE EXTENSIVE PREMISES.



RANELAGH WORKS, ROYAL AVENUE, CHELSEA, LONDON, S.W.

WELLINGTON TUBE WORKS,

GREAT BRIDGE, TIPTON, STAFFORDSHIRE.

JOSEPH AIRD,

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WELLS, BIRCH, RYDE, and CO., Limited,

HOYLAND SILKSTONE COLLIERIES,

Near BARNSLEY.

This Company is now in a position to raise **2000 tons per day of REAL OLD SILKSTONE GAS COAL.**

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

Full particulars will be sent on application to above address.

ALDER AND MACKAY,

MANUFACTURERS OF

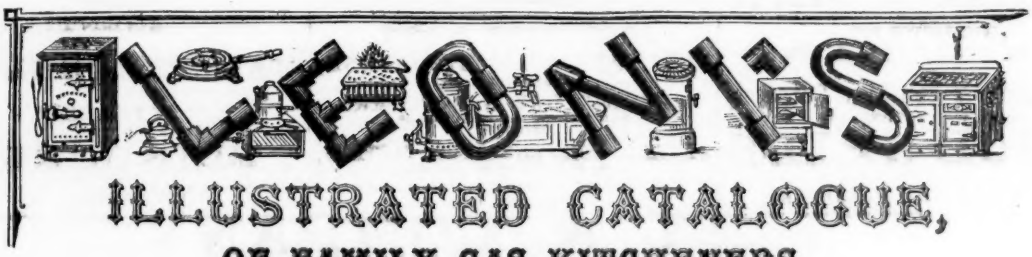
IMPROVED WET AND DRY GAS-METERS

IN CAST-IRON AND TIN CASES OF THE HIGHEST EXCELLENCE.

Original Manufacturers of Dry Meters in Cast-Iron Cases.

STATION-METERS, EXPERIMENTAL-METERS, PHOTOMETERS, & PRESSURE-GAUGES, &c.

GRANGE WORKS, EDINBURGH.



ILLUSTRATED CATALOGUE,

OF FAMILY GAS KITCHENERS,

COOKERS, HOT-PLATES, STOVES, BATH-BOILERS, &c; SENT FREE.

ADAMAS WORKS, ISLINGTON, LONDON. N.,

WAREHOUSE: 74, STRAND, W.C.

FLETCHER AND MURPHY,

GARRATT STREET WORKS, OLDHAM ROAD, MANCHESTER;

Manufacturers of

IMPROVED CONSUMERS WET GAS-METERS

IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

AND

IMPROVED DRY GAS-METERS;

STATION-METERS OF ALL SIZES, with PLANED JOINTS;

GOVERNORS, PRESSURE AND EXHAUST REGISTERS, TEST HOLDERS.

And all kinds of Experimental Gas Apparatus.

NO MORE WASTE LIME! SAVE THE VALUABLE PRODUCT!

G. R. HISLOP'S PATENT REGENERATIVE PROCESS

Most Effectively and Economically restores this waste *ad infinitum*.

The Patentee having devoted more time and attention to this subject than perhaps any other person living, is now in a position to recommend the adoption of this process to Gas Companies and Corporations with the utmost confidence in its practical utility, convenience, and economy. 1st. It restores the spent Lime at from one-third to one-half its original cost, apart from its undoubted convenience and the economy of space. 2nd. There is practically no limit to the duration of the Lime. 3rd. The cost of apparatus for the introduction of the process is very moderate and exceedingly durable. 4. The Patentee supplies special bricks and castings, erects and proves the process on the most favourable terms.

The process, in operation, may be seen at the Corporation Gas-Works, Paisley, where the Lime has been restored 120 times. Inspection is cordially invited.

For Terms, apply to GEO. R. HISLOP, F.C.S., Engineer, Gas-Works, PAISLEY, N.B.

PARIS EXHIBITION, 1878.

THREE MEDALS
AND
HONOURABLE MENTION
HAVE BEEN AWARDED TO
JOSEPH CLIFF & SONS
For their Various Exhibits, amongst which is a
SILVER MEDAL
FOR THEIR
PATENT MACHINE-MADE
RETORTS AND FIRE-BRICKS,
Being the Highest Honour given for this class.

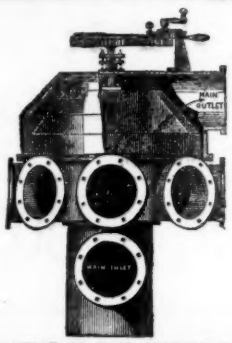
Established

1795.

JOSEPH CLIFF & SONS,

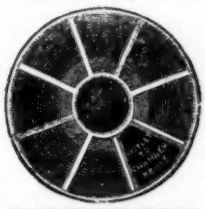
THE ORIGINAL
WORTLEY FIRE-BRICK WORKS,
NEAR LEEDS,
London Wharf: No. 4, inside Great Northern Goods Station, King's Cross, N. Liverpool: Leeds Street.

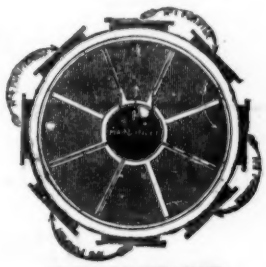
SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.



ELEVATION OF THE CENTRE-VALVE.

C. & W. WALKERS' PATENT CENTRE-VALVES.


PLAN OF THE VALVE.


PLAN OF THE BODY.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers on the system of three in action, and one out of action. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A considerable improvement and saving is effected in the cost of the connecting-pipes.

MIDLAND IRON-WORKS, DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

WILLEY & COMPANY,

GAS ENGINEERS,

WORKS: COMMERCIAL ROAD, EXETER,

INVITE THE ATTENTION OF GAS COMPANIES AND OTHERS FOR THE SUPPLY OF

EVERY DESCRIPTION OF GAS APPARATUS.

ENGINEERING DEPARTMENT.

NEW GAS-WORKS erected complete. Plans and Estimates furnished. MAINS, METERS, SERVICES, LAMPS, &c., adapted for Towns of any size. Gas Companies advised on Improvements, Extensions, and Alterations of Works.

GASHOLDERS AND TANKS.

RETORTS and RETORT-HOUSE FITTINGS, CONDENSERS, SCRUBBERS, ENGINES and EXHAUSTERS, PURIFIERS, STATION-METERS, GOVERNORS, VALVES, &c.

METER DEPARTMENT.

They beg special attention to the excellence and superiority of their WET and DRY METERS, several thousand being now in use by many of the largest Gas Companies in the West of England and South Wales. Warranted to measure correctly, and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured. A guarantee of Five years tendered with each Meter.

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An extensive variety of Choice Designs in CHANDELIERS, PENDANTS, BRACKETS, STAR and SUN LIGHTS, MEDIÆVAL FITTINGS for CHURCHES, &c.

PATTERN-BOOKS and PRICE LISTS furnished.

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GAS ENGINEERING WORKS, COMMERCIAL ROAD, EXETER.

GAS PURIFICATION
BY
OXIDE OF IRON.
GAS PURIFICATION & CHEMICAL Co., LIMITED,
PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.

JOHN WM. O'NEILL, Managing Director.

LAMBERT BROTHERS, WALSALL.
ALPHA TUBE & FITTING WORKS
Manufacturers of W. J. WARNER'S PATENT MARKET GAS STAND-PIPE.

Now ready, GAS CHANDELIER BOOK (Reduced Prices), 7s. 6d.

ROBT. DEMPSTER & SONS,
GAS ENGINEERS, IRONFOUNDERS, AND CONTRACTORS,

ROSE MOUNT IRON-WORKS, ELLAND, YORKSHIRE.

MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS;

CONTRACTORS FOR THE

ERECTION OF PUBLIC AND PRIVATE GAS-WORKS.

Plans and Specifications Prepared, and Illustrated Catalogues forwarded on application.

MESSRS. NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD,

MANUFACTURERS OF

IMPROVED CENTRE-VALVES,

PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.

WEST'S GAS IMPROVEMENT COMPANY.
LIMITED,

ARE NOW PREPARED TO SUPPLY AND ERECT THEIR PATENTED MACHINERY FOR

CHARGING AND DRAWING GAS-RETORTS,
And to enter into arrangements with GAS COMPANIES for its use upon moderate terms of Royalty.

The Patented Machinery has secured the approbation of all Engineers who have visited the MAIDSTONE GAS-WORKS, *where it is in full operation, and may be inspected at any time on application to the Manager.*

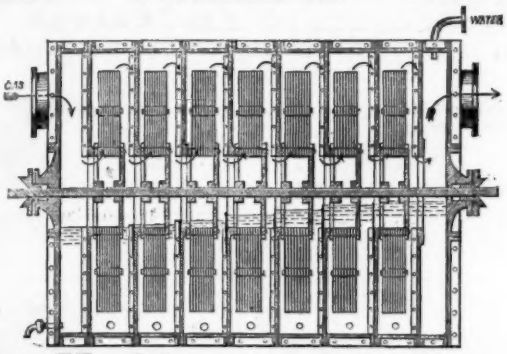
The advantages attending its use are—

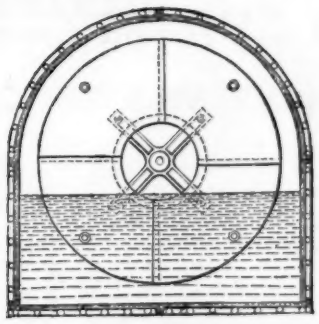
INCREASED VOLUME OF GAS PER TON.—INCREASED YIELD PER RETORT.—INCREASED BULK OF COKE FOR SALE.—REDUCTION IN LABOUR AND LESS DEPENDENCE ON SKILLED STOKERS.

A Pamphlet containing a description of the Machinery, and Copies of Reports on the working of the same, &c., will be forwarded on application to the MANAGING DIRECTOR, Maidstone. Communications may also be addressed to the Consulting Engineer, R. P. SPICE, Esq., M. Inst. C.E., 21, Parliament Street, London, S.W., or to the Engineer and Analyst, F. W. HARTLEY, Esq., A. Inst. C.E., 55, Millbank Street, London, S.W.

KIRKHAM, HULETT, & CHANDLER, LIMITED.

PATENT "STANDARD" WASHER-SCRUBBER COMPANY.





These Machines contain from 3200 feet to 65,000 feet of Wetted Surface.

The Special Merits of this Washer are as follows:—That it is not necessary to reduce the temperature of the gas to 60°, or thereabouts, to make it effective; **and that as no tar is retained in it, the illuminating power is not reduced as in Tower Scrubbers.** That the distribution of the liquor is made with unerring regularity. That it occupies very small space, so that it can be, at little expense, effectually protected from extreme changes of the weather. That the considerable expense of Coke or Wood, or other Scrubbing Material, is entirely saved, and that the great nuisance and cost of from time to time replacing the Scrubbing Material is avoided. That, by the revolution of the discs, the quantity of water carried up by them, and tending continuously to fall, exposes a very large amount of fresh wetted surface to contact with the gas as it ascends. That it is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured. That it is much cheaper than any other Scrubber that will do the same amount of work effectually. That it is the only Washer suitable for purifying Gas from all its impurities by solution. That it works with a minimum of pressure. That it takes out every trace of Ammonia from the Gas in once traversing the machine, as well as a very large quantity of carbonic acid and sulphuretted hydrogen. That it requires very little outlay for foundations.

The following Testimonials show the opinion of eminent Engineers as to the capabilities of the Washer:—

Messrs. Kirkham, Hulett, and Chandler. *The Gaslight and Coke Company, York Road, King's Cross, Jan.* 14, 1879.

Gentlemen,—In reply to your inquiry, I am pleased to say the Washer which was put in action at this station in October last has quite fulfilled my expectations, as it confirms the experiments I made in May last with the smaller machine. Working at four revolutions per minute, **it takes out every particle of Ammonia,** while purifying more Gas than it was intended to do. I enclose particulars of a week's working during our heaviest make, by which you will see that it yields the full quantity and strength of liquor, and works with little pressure. I am therefore quite satisfied with the machine, and trust it may meet with the success it deserves.—I remain, &c., (Signed) JOHN CLARK, Engineer.

The following Table shows the results of the working of one of these Washers, lately erected to purify 60,000 *feet of Gas per Hour, at the St. Pancras Station of The Gaslight and Coke Company:—*

1879.	Nos. of the Divisions and Strength of Liquor in each.										Water used per Ton of Coals.	Gas Purified per Hour, Cubic Feet.	Ammonia on Outlet.	Temperature.			Pressures.		Revolutions per Minute.
	1	2	3	4	5	6	7	8	9	10				Inlet.	Outlet.	Atmosphere.	Inlet, Inches.	Outlet, Inches.	
	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.									
January 7	11	9	7	5½	3¾	3	1¾	1¼	½	0	10 Gallons.	59,000	Nil.	74°	66°	31°	25	23½	5
,, 8	9½	7½	6	4½	3	2	1	¾	¼	0	10 ,,	78,000	Nil.	73°	61°	31°	28	26½	4½
,, 9	11	9	7	5	3¼	2½	1¼	1	¼	0	10 ,,	82,000	Nil.	74°	67°	33°	27½	25½	5
,, 10	10½	8½	6¾	5	3½	2½	1½	1	¼	0	10 ,,	66,000	Nil.	76°	64°	28°	28½	27	5
,, 11	12½	10	7¾	5¾	4½	3½	1¾	1¼	½	0	10 ,,	61,000	Nil.	73°	64°	27°	28½	25¼	5
,, 12	11	8¾	6¾	—	—	—	1¼	¾	¼	0	10 ,,	39,000	Nil.	74°	64°	27°	26½	25½	5
,, 13	13	10¾	8¼	6	4¾	3½	2	1½	½	0	10 ,,	78,000	Nil.	75°	65°	42°	28	26	5

Messrs. Kirkham, Hulett, and Chandler. *Corporation of Birmingham, Gas Department, Saltley Works, May* 23, 1879.

Gentlemen,—I beg to enclose you a copy of the results of the tests which, by the kind permission of the Engineer, Mr. Clark, I made on the 6th of March last, of the working of one of your "Standard" Washers and Scrubbers at the St. Pancras Station of The Gaslight and Coke Company, and I am of opinion that, for an apparatus occupying so small a space, they are exceedingly satisfactory.—Yours truly, HENRY HACK, Engineer.

Working Results obtained from Kirkham, Hulett, *and* Chandler's *Patent "Standard" Washer and Scrubber at the St. Pancras Station of The Gaslight and Coke Company, London, March* 6, 1879.

Gas passing per Hour, Cubic Feet.	—	Impurities in Gas per 100 Cubic Feet.			Temperature.		Pressure in Inches.	Revolution of Apparatus per Minute.	—	No. of Divisions and Strength of Liquor.										Water Used during Experiment. Gallons.
		SH_2	CO_2.	Grains. NH_3.	Washer.	Air.				10	9	8	7	6	5	4	3	2	1	
64,000	Inlet	2·00	2·00	158·8	72	57	21	4¼	Twaddel deg. at 60°	5·3	4·9	2·85	2·35	1·7	1·05	0·6	0·3	0·15	0·1	63
	Outlet	1·50	1·50	0·8	68	57	20		Acid, ounces.	11·0	8·4	6·3	4·5	2·7	1·7	1·3	0·7	0·3	—	

Messrs. Kirkham and Hersey. *The Leeds Corporation Gas-Works, Meadow Lane, Aug.* 14, 1879.

Gentlemen,—In reply to your inquiry of yesterday's date, I have pleasure in stating that the item appearing as income derivable from Ammonia in my estimate of revenue for current year is not an exaggeration. Our average income from Ammonia is 2s. 8d. per ton of coals carbonized, but at the works where your invention is in use we derive not less than 3s. per ton. Since the introduction of efficient Scrubbers at our works the greater yield of this product (now twice as valuable as coke to us) is such that the cost of Apparatus for its extraction can be wholly paid for out of from nine to twelve months gains. I am, Gentlemen, yours faithfully, (Signed) H. WOODALL, Engineer.

Messrs. Kirkham, Hulett, and Chandler. *Woolwich Equitable Gas Company, Engineers Office, Nov.* 1, 1879.

Gentlemen,—In answer to your inquiry respecting Washer erected here in September last, and which has been working here constantly since Oct. 1, I beg to say that it is working very satisfactorily. We sell over 24 gallons of 10 oz. liquor per ton of coal carbonized, and depend upon your Washer to extract all Ammonia, which it does satisfactorily, not leaving a trace of free Ammonia at the outlet. It takes little power to drive it, and the difference of pressure between inlet and outlet is scarcely noticeable, being less than half an inch. I consider it a very valuable machine, and have little doubt that it will pay for the outlay in a very short time. I shall be pleased to show it to any one that may be in want of such a machine, when they can see its capabilities themselves.—I am, Gentlemen, yours faithfully, (Signed) W. WHITE, Engineer.

Messrs. Kirkham and Hersey. *Heywood Local Board Gas-Works, Hooley Bridge, Heywood, Dec.* 1, 1879.

Gentlemen,—In reply to your favour of the 28th ult., I beg to state that the Scrubber is at work, and doing well. I shall be glad to show it to any inquirers.—Yours truly, (Signed) EDWIN BUCKLEY, Engineer.

Messrs. Kirkham and Hersey. *Phœnix Gaslight and Coke Company, Office, Greenwich, S.E., Dec.* 19, 1879.

Gentlemen,—In accordance with my promise that I would inform you as to the working of the "Standard" Washer erected by you here in June last, I now write to say that we are passing through it 100,000 cubic feet per hour (the quantity for which it is made) direct from the Condensers, "bye-passing" the whole of our Scrubbers, which, not being needed, have been standing still since the "Standard" Washer was put in use. It seems as though the Washer more effectually removed the Ammonia when taking the full quantity of gas than less; as, at the present time, at the sixth chamber (there being eleven in all) not a trace can be discovered either by turmeric or acid litmus paper. The difference in pressure between inlet and outlet is only ten-tenths of an inch. I need scarcely say, after the above, how perfectly satisfied I am. (Signed) P. J. WATES, Engineer.

For further particulars and testimonials, address Messrs.

KIRKHAM, HULETT, & CHANDLER, Limited, { 59 & 60, Palace Chambers, Bridge St., Westminster, London, S.W.

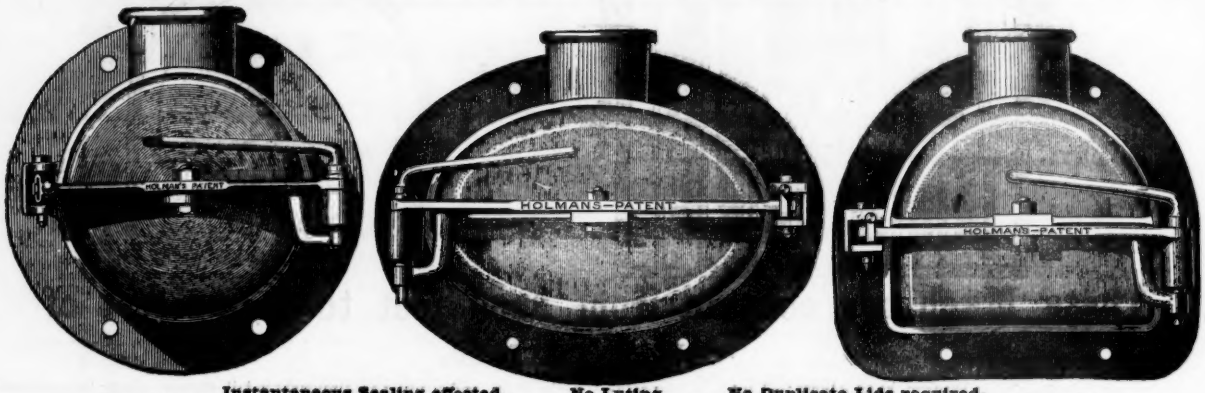
TANGYE BROTHERS AND HOLMAN,

CORNWALL HOUSE, QUEEN VICTORIA STREET, LONDON, E.C.

SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,

Anti-Friction Catches, and Self-Sustaining Cross-Bars.



Instantaneous Sealing effected. No Luting. No Duplicate Lids required.

Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Morton's Patent Retort-Lids are in use in nearly all the Principal Gas-Works in the United Kingdom and the Colonies; also on the Continent and in the United States of America. They are now made of the

SAME FORM OR SECTION AS THE RETORT. (See Illustrations above.)

Engineers preparing Specifications of New Works will be furnished with Dimensions of Stock Patterns, together with Approximate Weight and other data on application.

HUNT'S

EQUILIBRIUM DIRECT-MAIN GAS GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight & Coke Co. (19), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Leicester, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

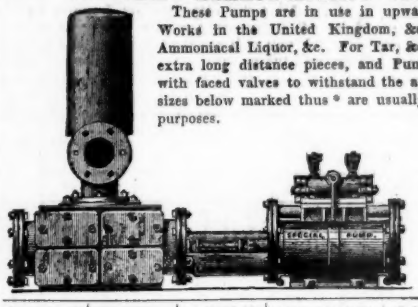
MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,

(Signed) JOHN JOHNSON.

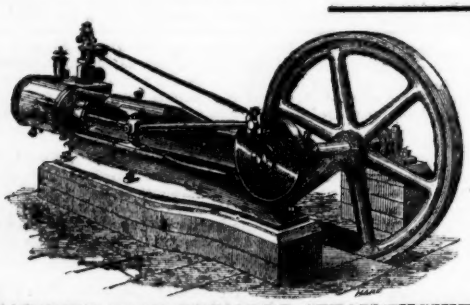
THE "SPECIAL" DIRECT-ACTING STEAM-PUMP.



These Pumps are in use in upwards of one hundred Gas-Works in the United Kingdom, &c., pumping Water, Tar, Ammoniacal Liquor, &c. For Tar, &c., they are provided with extra long distance pieces, and Pumps are entirely of iron, with faced valves to withstand the action of the liquid. The sizes below marked thus * are usually kept in stock for these purposes.

The quantities delivered of Tar should be taken about two-thirds that of water.

Diameter of Steam Cylndr.	Diameter of Water Cylndr.	Length of Stroke.	Gals. of Water per Hour, Approx.	Prices for Water.	Prices for Tar and Ammoniacal Liqr.
*3 in.	1¼ in.	9 in.	450	£16 0 0	£17 0 0
*4 ,,	2 ,,	9 ,,	815	18 0 0	19 0 0
*5 ,,	2¼ ,,	12 ,,	1,250	21 0 0	22 10 0
*5 ,,	3 ,,	12 ,,	1,830	22 10 0	24 0 0
*6 ,,	3 ,,	12 ,,	1,830	25 0 0	26 10 0
*6 ,,	4 ,,	12 ,,	3,250	30 0 0	31 10 0
6 ,,	5 ,,	12 ,,	5,070	35 0 0	36 10 0
*7 ,,	5 ,,	12 ,,	5,070	40 0 0	41 10 0
7 ,,	6 ,,	12 ,,	7,330	45 0 0	46 10 0
*8 ,,	6 ,,	12 ,,	7,330	50 0 0	52 0 0
10 ,,	6 ,,	12 ,,	7,330	60 0 0	62 10 0
10 ,,	8 ,,	12 ,,	13,000	75 0 0	77 10 0



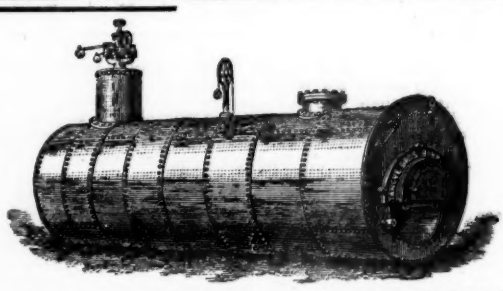
TANGYE'S HIGH-PRESSURE STEAM-ENGINE,

NEARLY 4000 IN USE.

The Design, Workmanship, and low prices of these Engines have called forth universal approval.

Nom. H.P.	2	3	4	6	8	10	12	14	20	25
	£28	£37	£44	£68	£86	£111	£122	£133	£185	£215

Including Governor and Feed Pump. Variable Expansion extra.



CORNISH, LANCASHIRE, "THE KESTERTON," VERTICAL, AND MULTITUBULAR STEAM-BOILERS OF SUPERIOR QUALITY ALWAYS IN STOCK.

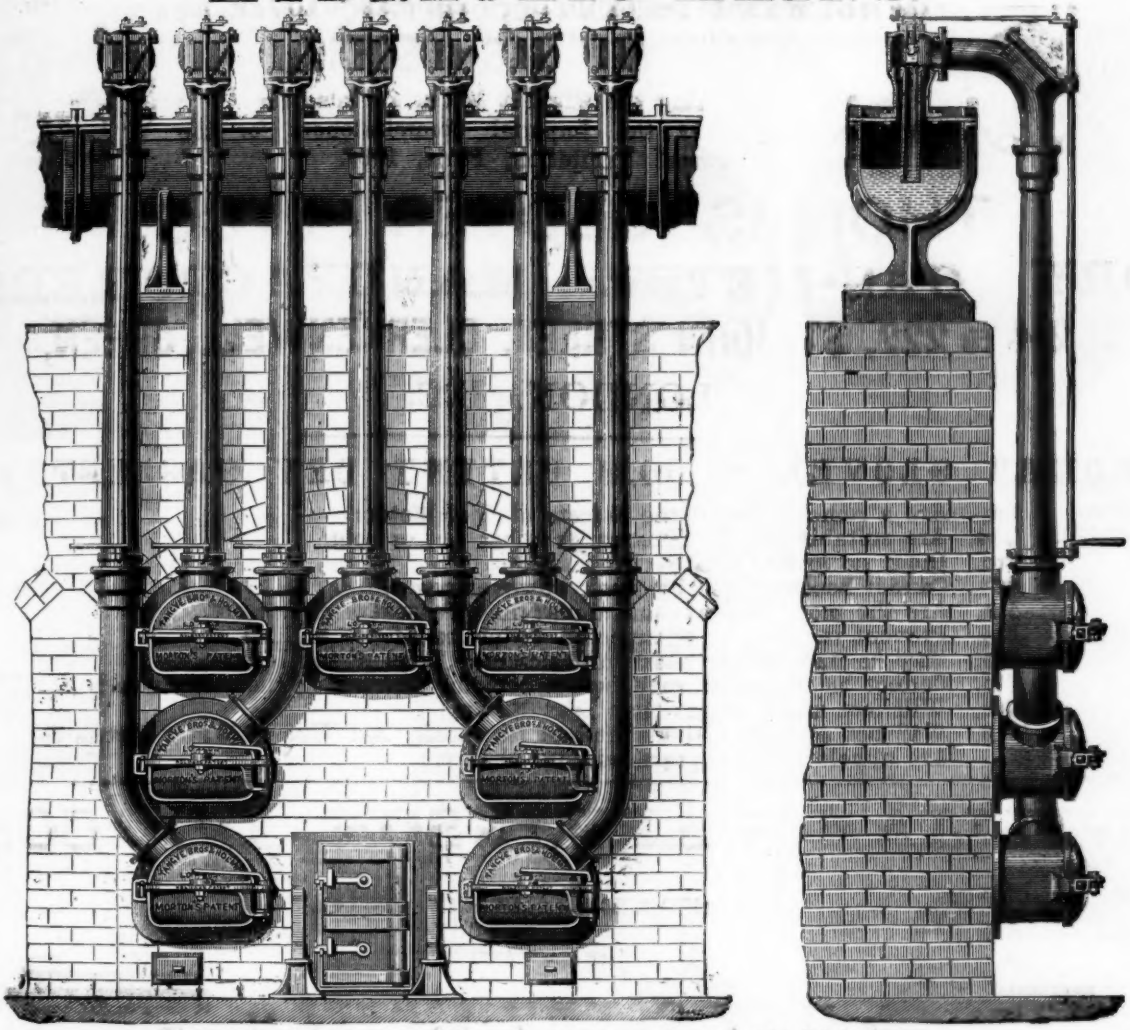
This Department having been greatly extended and furnished with the most approved Boiler-making Machinery and Tools, T. B. & H. are prepared to supply all kinds of Steam-Boilers with great facility at lowest current prices.

Also Makers of IMPROVED HYDRAULIC HOISTS, TRAVELLERS, CRABS, CRANES, PULLEY BLOCKS, HYDRAULIC AND SCREW LIFTING JACKS, LATHES, PUNCHING AND SHEARING MACHINES,

And all other Descriptions of Tools, &c.

FULL PARTICULARS, ESTIMATES, CATALOGUES, &c., ON APPLICATION.

HOLMAN'S PATENT
NON-PRESSURE VALVULAR SEAL-PIPES
FOR
HYDRAULIC MAINS.



The salient features of the above arrangement are as follows:—

1. The Seal is instantaneously opened and closed from the stage by the stokers.
2. There are only two positions for the actuating lever: one when the Seal is opened during the period of carbonization, the other when it is closed for drawing and charging the retort.
3. The retort can never be blocked, because the port directing the gas *through* the Seal is always opened, and the port permitting the gas to *pass* the Seal *direct* into the hydraulic main is also open while the retort is at work.
4. The manager and stokers can always see at a glance, by the position of the lever, whether the retort is duly unsealed while carbonizing its charge.
5. There are no extraneous seals, stuffing-boxes, hinges, screws, chains, pulleys, springs, teeth, or other complication belonging to the valves; they are made plain and strong for rough use, and will last many years without renewal.
6. The valve faces are always covered and never separated, hence no foreign matter can put them out of action.
7. They are positive, reliable, interchangeable, free from all the uncertainty of automatic arrangements, and low in price.
8. No extra pipes or connections are required, because the Valvular Seal-pipe is self-contained in the single branch of the ascension-pipe, which stands on the hydraulic main, and is easily accessible by removing an ordinary cover secured by two bolts only.

(238) TWO HUNDRED AND THIRTY-EIGHT HOLMAN'S PATENT VALVULAR SEAL-PIPES are being fitted to the Hydraulic Mains at the Radford Station of the Corporation Gas-Works at Nottingham.

(84) EIGHTY-FOUR more are being fitted to the Mains in the New Retort-House of the Gas-Works at Brentford, and they can be readily applied to existing Hydraulic Mains generally.

They are to be fitted to the Hydraulic Mains of the New Retort-House at the LONDON GAS-WORKS, and at other large stations.

Mr. MORTON writes in the following terms, under date of Feb. 3, 1880:—

"Gentlemen,—I have determined to use your HOLMAN'S PATENT NON-PRESSURE VALVULAR SEAL-PIPES in our new Retort-House. Will you, in the meantime, send me, as soon as you can, four as you are now making them. I expect to hear of a large demand for these Pipes. I like the idea of always maintaining a passage through an ordinary dip."

ESTIMATES for Retort Work, including Mouthpieces fitted with Morton's Patent Self-Sealing Lids and Holman's Self-Sustaining Cross-Bars and Fastenings, Hydraulic Mains and Ascension-Pipes, fitted with Holman's Patent Non-Pressure Valvular Seal-Pipes complete (as per accompanying illustration), will be forwarded to Engineers on receipt of particulars of intended erections, or re-setting of Retorts during the current or ensuing season.

Engineers preparing Specifications will be furnished with Tracings and all necessary data on application.

Sole Makers:

TANGYE BROTHERS AND HOLMAN,
HYDRAULIC AND GAS ENGINEERS,
CORNWALL HOUSE, QUEEN VICTORIA STREET, LONDON, E.C.

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

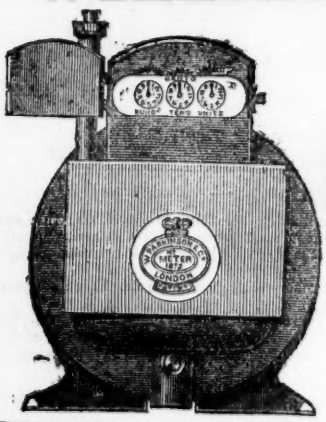
214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS.

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON AND CO.,



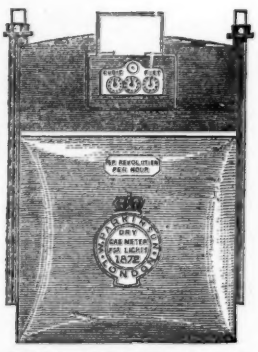
(ESTABLISHED 1816,)

MANUFACTURERS OF

WET & DRY METERS,

STATION-METERS & GOVERNORS,

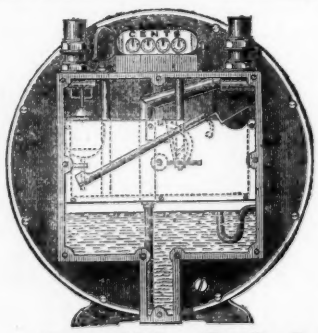
EXHAUSTER REGULATORS,



PRESSURE REGISTERS, EXPERIMENTAL APPARATUS, GAUGES, WATER-METERS, &c.

HUNT'S PATENT IMPROVED COMPENSATING METER.

In this Meter, the action of the measuring-drum is reversed. By this arrangement an improvement is effected in the registration at high speeds, which, in many tests, has not varied from the smallest light to three times the capacity of the meter. It works equally well under all pressures. The range of error between the high and low line is much smaller than that allowed by the "Sale of Gas Act."



The Meter has been critically tested, and most favourably reported upon by official Meter Inspectors in London and Birmingham.

W. PARKINSON and CO. have made arrangements for the manufacture of these Meters, both in tin and cast-iron cases, and for the alteration of old ones to this principle, which is confidently recommended as possessing every quality that can be desired by Gas Companies, Corporations, or Private Consumers.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO CORRESPONDENTS.

H. C. O.—*The owner of the engine, decidedly. The most recent case in point was one at Croydon last year, noticed in the* JOURNAL, *Vol.* XXXIV. *pp.* 51 *and* 333.

T. A.—*Too late for notice this week.*

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, APRIL 6, 1880.

Circular to Gas Companies.

METROPOLITAN gas affairs occupy the most prominent place in the gas world. The Companies supplying London are remarkable for the extent of the area which they supply, and for the capital employed in them. The Chartered Company—we use the shorter term—is now the largest Gas Company in the world. They supply scarcely less than two-thirds of the Metropolitan area, and northern amalgamation is almost completed. That it is not fully completed is not the fault of the Chartered Company, who have used their best endeavours to bring round the Directors of the London Company to agree with opinions which are now generally entertained. That a small area in the middle of London should continue to be supplied by a Company whose works are distant, and perhaps are not the best adapted to supply mid-London, and who, moreover, work under what we might almost, with justice, call mediæval gas legislation, in the midst of the district of another Company working under all modern enactments, is an anomaly which is perhaps only to be found in the Metropolitan gas world. Some have thought that long ago the Directors of the London Company would have seen that their interest was to split up their district into northern and southern areas, the former of which would go naturally to the Chartered, and the latter to the Phœnix Company. The arrangements of the division of capital might have been made without difficulty. We see now how, by the system adopted by the valuators for the Government, the capital accounts of Companies can be regulated, and we have no doubt that Mr. E. J. Smith, the gentleman employed in negotiating the terms of the Metropolis Water-Works purchase, would settle without any trouble the value of the several portions of the London Gas Company's undertaking; and that which would naturally go to the Chartered could easily be valued. There is little possibility of extension of consumption or of improvement in profits in that part of the concern to which we are referring, and the Company might very well let it go to the Chartered at its natural value. As regards the southern portion of their undertaking, the prospective increase of business would entitle them to advantages which they can only obtain by union with the South Metropolitan Company. It is, in our opinion, so eminently desirable that the Metropolitan gas supply should be divided into two districts, one south and one north of the Thames, that we earnestly recommend the London Company to join in the general arrangement which has now almost covered the Metropolis.

The Directors of the Phœnix Company perhaps never did a wiser thing than in joining the South Metropolitan Company. Some people thought the Company were eating humble pie; but they chose their own dish, and now they have allied themselves to a Company with whom a few years ago they might possibly have taken a leading part. It matters nothing, however. The amalgamation has been effected, to our great satisfaction, and, we think we may add, to the satisfaction of all concerned in the Company. The final meeting of the Phœnix Company will take place to-morrow, when, as a matter of course, the usual maximum dividends will be declared; but from and after the 1st of January last the scheme for the amalgamation of the Company with the South Metropolitan comes into force, and then the sliding scale begins to operate. We shall not here speculate on the financial prospects of the Company under the new *régime*. It must be successful, but how successful only the future can determine. What may be said, and with great emphasis, is, that the position of the late Company is immensely strengthened by the union just effected. As a matter of fact, the business of the Phœnix Company has been continually increasing, and, as the district which it formerly occupied fills up, it must necessarily be added to. We shall have no occasion to make further reference to the Phœnix Company. For the future its existence will be merged into that of the South Metropolitan, and to-day we have simply to record the dividends which will be paid under the old arrangements. It is scarcely necessary to mention that the final meeting of the Phœnix Company may be expected to pass off in a manner pleasant though just a little lugubrious. We are quite certain that there is not a Shareholder who will not regret the disappearance from the direction of the associated Companies of Mr. Edward Horner, a man of great capacity for business, and of long experience in the direction of the Phœnix Company. He will be missed whenever matters of importance to the combined Companies arise. The changes in the directorate of the Phœnix Company are of some importance, but they were inevitable. We are sorry to see that some of the very capable men who shared in the direction of this Company have, under the circumstance, been compelled to retire; but it was unavoidable. The South Metropolitan Company will be greatly strengthened by the accession they have received from the Board of the old Company. The proposed changes in the Auditors are also worthy of notice. We sincerely hope that Mr. Puckle will be unanimously elected to one of the posts rendered vacant by the retirements announced. We see with regret that Mr. Crookenden will retire from the secretaryship. He is still in the prime of life, with plenty of good work in him, and we are sorry that he does not find it consistent with his welfare to go on with secretarial duties.

The *entente cordiale* is about to commence. The Shareholders of the Phœnix Company meet at the Bridge House Hotel at two o'clock to-morrow, and the South Metropolitan Company's Proprietors were to have met at the Terminus Hotel at the same hour; but, under the circumstances, it was considered advisable that the Shareholders of the two Companies should have an opportunity of meeting on the first occasion which presented itself. The meetings have, therefore, been so arranged that one shall take place at the Bridge House Hotel at 2 p.m., and the other at the Terminus Hotel at 2.45 p.m. Thus the Shareholders of the two Companies which are now virtually one will have opportunity of meeting together and conferring upon the future of the union. It cannot be doubtful, for there is nothing to interfere with the progress of the South Metropolitan Company, except dear coal and bad times. With the Act for the acquisition of additional land for the erection of new works opens up a future "vague and im-"mense," as a Frenchman would say, for the associated Companies. Nothing, however, can prevent the rapid development of the sale of gas in the vast area now supplied by the united undertaking.

The accounts of the two Companies, which for the last time are kept separate, show, in both cases, increasing prosperity. As mentioned above, the Phœnix Company pay maximum dividends, and have a balance left of £12,697. The South Metropolitan Company have also had a prosperous half year, and their profits and the price charged allow them to

pay a dividend of eleven and three-quarters per cent. on the "A" stock, and eleven per cent. on the "B" stock. This is in accordance with the arrangements made in the scheme for the amalgamation with the late Surrey Consumers Company. We are told that when the Bill promoted by the South Metropolitan Company is before Parliament, a determined effort will be made by the Local Authorities to reduce the initial price of gas, so as, if possible, to bring down the standard charge, and consequently lower the dividends. The attempt will be extremely unfair, for no Company have done so much to cheapen gas as the South Metropolitan. The Shareholders of this Company might then well be allowed to participate in the extra profits which could be made under a system which their advisers, we cannot say invented, but most certainly brought into use.

The Commercial Company, a report of whose half-yearly meeting will be found elsewhere, offers another illustration of the value of amalgamation, which might well be extended. The Company should hardly stand alone in an isolated position, but they flourish notwithstanding. They have the advantage of the sliding scale, which enables them, as we said last week, for the past half year to pay 11¼ per cent., and place £3445 to the reserve-fund. The continual increase in the demand for gas in the Company's district has obliged the Directors to extend their Poplar works, and for this purpose they require additional capital. Happily for the Shareholders, their last Bill slipped through Parliament without the imposition of auction clauses, so the new capital (£60,000) will be allotted *pro ratâ* among the existing Proprietors. This, we may remark, is no small gain to them, for shares in the Commercial Company stand at a very high premium. Judging from what passed at the meeting last Friday, not every Gas Shareholder is in love with the sliding scale, no matter what may be the dividends its application brings. Mr. R. Rawlinson, C.B., for instance, prefers a steady ten per cent., earned by making a fair charge for gas, to any fancy dividend gained by reducing the price. How far we agree with Mr. Rawlinson our readers know. Ten per cent., we may take it, is sufficient interest in a substantial concern like a Gas Company, which, properly managed, is as safe to yield profits as the Bank of England. We must, however, of course, congratulate the Commercial Company on their prosperity, and express a hope that it will be long maintained.

The meeting of the Alliance and Dublin Consumers Gas Company was held on the 31st ult. We have had the great pleasure of tracing up the condition of this Company from its period of serious depression in 1874, to a point of prosperity which has reached its acme at the present time. We may stop here for a moment to mention that the condition of the Company at present is entirely owing to the exertions of one man—Mr. W. F. Cotton, the Secretary and Manager, who joined the concern at a critical moment, and saved it from something like bankruptcy. Passing from this matter, we may proceed to a consideration of the present condition of the Company. They are able to pay maximum dividends for the past half year. The consumption of gas goes on increasing so much that a diminution of threepence per thousand feet in price only resulted in a decrease of £1800 in income. Now favourable coal contracts enable the Directors to announce a further reduction of fourpence per thousand feet, to take effect from the September quarter. Liberality like this has rarely been shown by Gas Companies, and certainly by no one which has had to pass through so severe an ordeal as the Alliance and Dublin Company. We are happy to see that the efforts of the Manager to introduce gas for other than illuminating purposes have been made completely successful. The number of gas-engines in use is 32; the gas-stoves let on hire now number 50, which, of course, is exclusive of those that have been sold. These results may not appear large, but, as a matter of fact, they are great for Dublin, in which city it is very difficult to introduce new ideas. A good many of the inhabitants, however, seem to have taken kindly to the use of gas for cooking and heating purposes, and we are certain that every person who uses an apparatus will induce others to follow in his train. An admirable example in the way of promoting the use of mechanical apparatus has been set by a Sewing Machine Company, who let out their machines for a month (taking security) free of any charge. Gas Companies would, of course, charge for what gas is consumed; but all we wish to point out here is, that the apparatus should be supplied to the consumer as cheaply as possible, and that the sale of gas should be the sole source of profit. The Dublin Company are doing so well, and their prospects are so encouraging, that it is quite unnecessary to make any further remarks here. We should have said above that the Company have paid a very proper and substantial compliment to Mr. Cotton by raising his salary £250 a year.

The Sheffield United Gas Company held their usual half-yearly meeting on Thursday last, at which maximum dividends were, of course, declared, and a large balance was carried over. The price of gas in Sheffield is very low, and we could scarcely expect a further reduction, notwithstanding the fact that the reserve-fund of the Company is full. Since favourable coal contracts have been made, it may be anticipated that before the next meeting of the Company efforts will have been made to ascertain how far a reduction can be made in the price of gas. People in the North look to Sheffield as a guiding star. It is now one of the few Companies of any extent in the North of England left in possession of a gas undertaking, and it is their bounden duty to set an example which all Gas Companies should follow who wish to retain their property and position.

An exhibition of gas apparatus has been held during the past week at Ipswich, in which the leading part was taken by Mr. Ford Goddard, the sub-Engineer of the Gas Company. The exhibition was a decided success, and will, no doubt, persuade a large number of the inhabitants of Ipswich and its vicinity to resort to the use of gas in summer time for the purposes of cooking. It should be always fairly explained to consumers that the great advantages to be derived from the use of gas is during the summer months, when heat is only required for cooking purposes. When it is desired to boil a kettle or cook a dinner, all that is necessary is to turn a tap and put a light to the gas. As soon as the meal is cooked the gas may be turned off, and all further expense saved. These exhibitions of gas appliances are likely to prove of the greatest value to Gas Companies.

The notification of the Metropolitan Gas Referees for the ensuing half year has been issued. No alterations have been made in the summer half year's arrangements. The regulations for impurities are the same as in previous corresponding periods; and it is not to be expected that any changes will be made at present in the modes of testing the illuminating power of the gas. The arrangements settled by the original Referees remain in full force, and new tests for sulphuretted hydrogen are not at present accepted.

Water and Sanitary Notes.

The fate of the Metropolis Water-Works Purchase Bill, under the changed aspect of political affairs, is likely, we think, to remain unaltered. Perhaps its chances of getting through the House of Commons will be rather improved by the accession to power of a Government of which Mr. Fawcett, if not a member, will be a strenuous supporter. Whoever may come into office, the Bill must be taken up at the point at which it was dropped by Mr. Cross. If the Metropolitan public are determined to have the water-works, they must pay for them, and they have been told what they are worth. The mode of payment is eminently favourable to the purchasers, and is equally satisfactory to the sellers. As matters now stand, the Bill will probably have to go over for another year; but the purchase cannot be long delayed. Even the present postponement may necessitate a new valuation, which will considerably raise the amount of the purchase-money. It is useless now to attempt to abate one penny of the terms. The Companies have given in their *ultimatum*, and nothing less than the terms settled in the Bill will be accepted. It will be a grievous misfortune for the Metropolis if this bargain be not carried out. We wait, of course, for an expression of opinion by the leading Metropolitan Authorities, which has not yet been given. As a matter of fact, we scarcely know what are their ideas as to the conditions of purchase. They, doubtless, will be somewhat alarmed at the amount of money which is asked for the water undertakings; but haggling is useless. The terms have been settled, and they, or none, must be accepted. Whoever may be the Home Secretary in the new Government which is imminent, he will have to take up the question; but with what result we are unable to foresee. Supposing the Bill to go on, it will be sent to a Committee of the House of Commons, who will decide its fate. The position of the Water Companies is, we think, impregnable; but what the Authorities may have to say, we must wait to learn.

The East London Water-Works Company held their half-yearly general assembly on Thursday last, when a dividend of six and a half per cent. per annum was declared. The increase in the Company's business may be inferred from the number of new houses built in their district, all of which, we believe, are supplied on the constant system, and

it is clear that the purchase of the undertaking would confer little or no advantage on the inhabitants of East London. The Company possess one of the most improving districts in the Metropolis, and it is quite certain that the valuators have not over-estimated the worth of this undertaking.

URBAN WATER SUPPLY.

We resume in this article the consideration of the Yorkshire towns in respect of water supply, commencing with those in the sub-drainage area of the Colne, a feeder of the Calder. Most of these towns are at present either dependent on Huddersfield, or expect to be so, and the sources of supply are on the moors to the south of that town, where there is a large tract of upland receiving a heavy rainfall, which is conducted, chiefly by catchment drains, into magnificent storeage reservoirs at a considerable elevation, and whence the water passes down by gravitation to service reservoirs near the towns. The whole system of works is estimated to yield a daily supply of nearly 4 million gallons. The supply is constant, and no doubt need be felt of its permanence, even after the longest droughts and successive dry seasons. The actual quantity consumed or wasted in Huddersfield itself is not, however, known, neither is there any information as to the quantity supplied to any of the dependent towns. It is believed that the average consumption in the town of Huddersfield and in the several districts outside the borough is from 1½ to 2 million gallons per day, and the amount paid in the form of rent is something like £20,000, which would show a charge of about 7d. per thousand gallons. The cost of works would seem to amount to about £7 per head of the population to be supplied. A number of adjacent townships are included under the Huddersfield Acts, and are supplied more or less completely. It must be understood, however, that in many of them water is obtained to some extent from wells. Marsden-in-Almondbury has one-fourth of its houses supplied from the Huddersfield reservoirs, the rest being from springs. This is the case also to a smaller extent with regard to Kirkburton, Kirkheaton, Lepton, Meltham, South Crosland, Mirfield, and Longwood. Golcar is entirely supplied from Huddersfield. Batley, in the sub-drainage area of the Colne, has a catchment on the adjacent moors, near Holmfirth, and reservoirs for storing the water. The supply is constant, and amounts to 40 gallons per head per day. The cost of works has been more than £12 per head of the population, and the charge appears to average about 9d. per thousand gallons. The works are new, and are not yet completed. Batley was once joined with Dewsbury and Heckmondwike in its water arrangements; but in 1871 an Act was passed authorizing the present works, and leaving the towns independent. Ossett-cum-Gawthorpe, which has a large population, has a reservoir supplied by the Batley Corporation. The quantity of water taken in 1878 was only 6½ gallons per head per day, but there is provision to increase to more than four times this quantity. The local works are new. No estimate is given in the Return of their cost, or of the charge for water.

A number of towns in the Calder Valley are named in the Return, but, except with regard to Upper Thong, they either have not any public works, or no information is given. Some of them, as Holme, Barkisland, Rishworth, Shelley, Altofts, Queensbury, Shelf, Shepley, Scammonden, Soyland, Thurstonland, Warley, Cartworth, Cumberworth, Nether Thong, Skelmansthorpe, Midgley, and Honley, are supplied more or less completely from wells and springs, but no reply has been sent by the Local Authorities to the questions asked as to quantity or charge. Holmfirth and a number of towns near Wakefield, of which Stanley and Alverthorpe are the largest, are not alluded to. Upper Thong is partly supplied from springs and wells by the Local Authorities, the water being collected into a reservoir. The quantity obtained and available is said to be equivalent to 105,000 gallons per day for the population of 2400, but the quantity actually supplied is only 11,200 gallons, or about 5 gallons per head per day. The works have cost a sum equivalent to £1 16s. 6d. per head of the population, and the charge, estimated from the rate, would seem to be only 4d. per thousand gallons, but this does not pay a fourth part of the annual charge for interest on borrowed money. Wooldale, the population of which is double that of Upper Thong, is stated to receive its supply from the same reservoir, but there is no account of quantity or charge. The works were not complete when the return was made. Wakefield, one of the largest of the Calder Valley towns, receives at present a supply of doubtful quality, partly from the River Calder, and partly from a well, the water being pumped into a reservoir, and filtered by Spencer's iron carbide process. The supply has been upwards of 50 gallons per head per day, and the charge 6d. per thousand gallons, the works having been carried on by a Company. The Corporation have recently purchased the property of the Company at a cost equivalent to nearly £7 10s. per head of the population, and they are this session in Parliament seeking for powers to establish gravitation works. Normanton receives nearly 10 gallons per head per day from a colliery sinking, at a cost equal to nearly £4 10s. per head of the population, and the charge is about 9d. per thousand gallons. The works are, however, unfinished. There is one other town on the Calder—Farnley Tyas—mentioned in the Return. A reservoir constructed to store the water of natural springs supplies about 6 gallons per head per day. The works are in the hands of the Earl of Dartmouth.

Below the confluence of the Calder with the Aire there are four considerable towns on the latter river—Pontefract, Knottingley, Snaith, and Methley. Of these, Pontefract is largely supplied from wells, the water being pumped into a reservoir. The daily supply is about 25 gallons per head, but more is obtainable. The cost of the works has been about 40s. per head of the population, and the charge is 10d. per thousand gallons. Methley has private wells and no works. Snaith and Knottingley are not referred to in the Return. Rawcliffe and Ferrybridge, smaller towns, are also not noticed.

We come next to the drainage area of the Don, on which is also a large manufacturing population distributed in forty towns, of which Sheffield, Rotherham, Barnsley, Dewsbury, and Doncaster are the most important. Sheffield, under the management of a Company, has a gigantic system of reservoirs, which retain the surplus waters of the Upper Don and its tributaries. One of these, of the largest containing power, has been completed for some years, but is not yet utilized. The town has a constant supply of 20 gallons per head per day. The works have cost about £7 per head of the population, and the charge is 8·4d. per thousand gallons. Barnsley, the next most important town, is supplied by water collected from a gathering-ground of 1750 acres, and stored about nine miles from the town. The supply is constant, and amounts to more than 40 gallons per head per day. The works have cost £6 per head of the population, and the charge is at the rate of 6d. per thousand gallons. Barnsley also supplies Monk Bretton, Worsborough, Dodworth, and part of Darton. To the former town the water is sold by meter to the Local Authorities, at the rate of 1s. per thousand gallons, but the quantity taken is stated to be less than a gallon per head of the population per day. This is probably an error. The local works have cost about 30s. per head of the population. Worsborough receives 7½ gallons per head per day, at a charge of 1s. per thousand gallons. The local works have cost at the rate of 17s. per head of the population. At Darton the supply is only 4½ gallons per head per day. The works have cost 17s. 6d. per head, and the charge is also about 1s. per thousand gallons. Dewsbury is, with Heckmondwike, now supplied from the Dunford Bridge reservoirs, retaining the waters of the Upper Don. It was formerly combined with Batley, but since 1876 has been independent. The supply is intermittent, and regarded as insufficient. In winter it amounts to 24 gallons per head per day, but in summer is only half that quantity. Additional works are in progress. At Heckmondwike the daily supply is stated to be 30 gallons per head, but irregular. The cost of works to Dewsbury has been rather more than £3 per head, and to Heckmondwike £4 5s. The charge at Dewsbury, as estimated by the rates, is 10d. per thousand gallons, and at Heckmondwike only 5d. This requires explanation. Ravensthorpe is supplied from Dewsbury with 10 gallons per head per day at the charge of 13d. per thousand gallons. The cost of local works was 18s. per head of the population. Rotherham is a large town supplied from a gathering-ground of 2300 acres of moor land, the water being collected into large storeage reservoirs, which also supply several other smaller places. The supply is 30 gallons per head per day, and the cost of works rather more than £4 per head of the population. The charge is only 4½d. per thousand gallons. Rawmarsh receives 8 gallons per head per day from Rotherham, at a charge of nearly 10d. per thousand gallons. The local works cost about 30s. per head of the population. Greasborough is partly supplied from Rotherham, but no details are given in the Return. Chesterfield is supplied by a Company from reservoirs, but no information is afforded concerning it. The Chesterfield Water Company also supply Newbold and Dunstan, Dronfield, Whittington, Brampton, and Walton. At Dronfield we are told that about 5 gallons

per head are received, but the supply is only constant in the lower part of the town.

The list of towns left unsupplied, and dependent on local wells within the sub-drainage area of the Don, is very large. It includes Penistone (where, however, works are in contemplation), Thurlstone, Flockton, Askerne, Emley, Gunthwaite, Swinton, West Clayton, Hepworth, Hoyland, Crowle, and Tickhill. The town of Doncaster is supplied from the River Don with 30 gallons per head per day. The works are in construction, and no details are given in the Return. Clay Lane receives, per head per day, 16 gallons of water obtained from springs and a brook, collected into a reservoir and filtered. The cost of works has little exceeded 20s. per head, but the charge is not stated. Mexborough receives 6 gallons per head from a Company drawing water from artesian wells. The cost of works has been small, but no charge is stated. Wombwell has a system of catchwater drains recently constructed, and is also supplied from wells. No figures are given in the Return. Wath-upon-Dearne has 12½ gallons per day from a Company. There are, besides, several towns not included in the Return.

The River Derwent drains a large part of the oolitic country on the eastern bank of the Ouse, but there are few towns in its drainage area. Malton, the largest, is supplied from springs, the water being pumped into a reservoir. The supply is 13½ gallons per head per day, the cost of works was about 15s. per head of the population, and the charge is 6d. per thousand gallons. Pickering is supplied by a Company; Hinderswell, from wells and an adjacent stream. No information is given concerning them, and the other towns in the district are not referred to.

On the estuary of the Humber there are several towns, but only two of great importance. These are Hull and Grimsby. Hull is supplied from wells of considerable depth, reaching the chalk. As much as 45 gallons of water per head per day is delivered. The cost of works has been £1 14s. 3d. per head of the population, and the charge is only 3·2d. per thousand gallons. Large as the supply is, the Corporation have before them schemes for increasing the quantity. Grimsby, like Hull, is dependent on wells, part of the supply being pumped into a reservoir. The supply is constant, and at the rate of 22 gallons per head per day. The cost of works has been nearly £2 per head of the population, and the charge is 4·7d. per thousand gallons. The town of Barton is supplied by wells, but has no works. Clee and Cleethorpes are supplied from the Grimsby works. Patrington is not included in the Return.

There are some towns on the Yorkshire coast that are properly considered as outlying members of the Ouse drainage system. Scarborough is the most important. Formerly supplied by a Company, the works have recently been purchased by the Corporation. Wells and springs are the sources of supply, and additional wells are being sunk. The allowance is 33 gallons per head per day, and the supply is constant. The works are stated to have cost rather more than £3 per head, but this will be increased. The charge has been 7½d. per thousand gallons. Whitby is supplied by a Company from springs, the water being collected into a service reservoir. The supply is constant, and amounts to 24 gallons per head per day. The cost of works has been at the rate of £1 8s. 6d. per head of the population, and the charge for water is 5·3d. per thousand gallons. Filey receives a constant supply of filtered water from a Company, but no figures are given in the Return. Bridlington has 25 gallons per head per day from deep wells. The works have cost about 45s. per head, and the charge, as calculated from the amount of the rates, is nearly 2s. per thousand gallons. Hornsea is supplied from wells, but there are works in construction. Hinderwell is supplied by wells and a brook, the water from them not being filtered.

In the Hull river drainage area are the towns of Beverley, Driffield, Cottringham, and Broughton. All these towns are dependent on wells, and no information concerning details is given in the Return. There are also towns on the Ancholme, which flows into the Humber, but they are not included.

It will be evident from this account that a very great difference exists as to the quantity and cost of water supply in these important manufacturing districts; but it is equally certain that the returns are imperfect and unsatisfactory. From the condition of the country, the water supplied is chiefly obtained from catchment areas, rarely from wells, and hardly anywhere from rivers. The daily supply varies greatly in amount, and the charge is also very different in different places.

THE THAMES SEWAGE INQUIRY.

The arbitration case between the Conservators of the Thames and the Metropolitan Board of Works has now come to a close, so far as concerns the hearing of evidence and the speeches of the learned Counsel. From first to last, twenty-five days have been given to the inquiry, and there can be no doubt that it has been of a singularly painstaking and exhaustive character. The next step consists in the presentation of a report to the Board of Trade by the Umpire and the Arbitrators. At the last sitting, Sir Charles Hartley, the Umpire, observed: "It now only remains for me to say "that we shall report to the Board of Trade, after having "carefully weighed all the evidence which has been brought "before us." Mr. Pope, Q.C., the leading Counsel for the Conservators, asked Sir Charles, "Have you considered "whether it ought to be a joint report?" to which the reply given was, "We hope so, if possible." Mr. Bramwell, the Arbitrator appointed by the Metropolitan Board, thereupon remarked that he had thought it would be competent for either Arbitrator to send in a separate report. "It seems to "me," continued Mr. Bramwell, "that in an inquiry like "this, it is not unreasonable that the opinion of each member "of the tribunal should be before the Board of Trade, if "there should be a difference between us." "If Captain "Galton and myself agree," Mr. Bramwell went on to say, "the benefit of Sir Charles Hartley's opinion should be had "in addition to the opinions of my co-Arbitrator and myself." Mr. Pope also suggested that the Board of Trade, would most likely prefer to have the joint opinion of the three authorities, and Mr. Bramwell added, "It would be a misfortune if, "when we have an Umpire of the position and attainments "of Sir Charles Hartley, his opinion were not to be had." Captain Galton believed that a report from the Umpire was contemplated by the framers of the Act.

A joint report, or three several reports, will thus be laid before the Board of Trade, and that department will then have to come to a decision. At the present moment it will be interesting to observe what is the actual contention between the Conservators and the Metropolitan Board. Mr. Pope, who had the final word, stated in his concluding address that the Arbitrators were not called upon to decide whether certain obstructive banks in the River Thames near the great outfalls were actually composed of matter discharged from the sewers. The question, as put by the learned Counsel, was whether the mud-banks had "arisen" from the flow of the sewage. A distinction was to be drawn between "banks formed of sewage," and "banks formed "because of the discharge of sewage," and it was the latter point on which the case for the Conservators was made to rest. The Thames was described as a river highly charged with natural detritus, into which a large quantity of sewage matter was discharged from the outfalls. The result was compared to something like the A. B. C. process, in which there was a mixture of clay and other ingredients with sewage, the effect being to precipitate certain materials which otherwise would remain suspended. It was contended that the flocculent matter of the sewage, on coming in contact with "the finely-attrited matter" in the Thames, became attached to the latter, and, under these circumstances, the combined sewage matter and detritus formed a deposit. We think it must be acknowledged that this contention is rather weak. In the first place, it reverses the precipitating process, sewage being poured into a mixture of clay and water, instead of the latter being poured into the sewage. This might not matter if a due proportion were observed, instead of a relatively small quantity of sewage being put into a large volume of river water, the sewage being expected to play the part of a precipitating agent. But a more serious objection consists in the fact that the flocculent matter of the sewage is lighter than the detritus which it is said to precipitate. Clay may serve to sink sewage, or that part of sewage which is lighter than itself, but how the sewage is to sink the clay is not so apparent. Mr. Pope based his argument on a statement by Mr. Hawksley—who was a witness for the other side—that the detritus entangled in it about one-eighth of its weight of organic matter. "Of course," said Mr. Pope, "if you get a particle weighing one-eighth more, the same "forces which gave the original particle flotation would fail "to float the particle which weighs this additional one-eighth; "therefore, down it would go." The explanation startled Mr. Bramwell, who exclaimed, "Surely, can that be so?" "Is it not so?" rejoined Mr. Pope. Mr. Bramwell thought not, any more than sticking one pound of cork on to eight pounds of wood could be expected to make the whole affair sink. Mr. Bramwell's reading of Mr. Hawksley's evidence was that flocculent matter, which otherwise would not go

down, would be taken down by the attrited matter which would sink, and Mr. Hawksley reckoned that the flocculent matter would amount to one-eighth the attrited matter to which it became attached.

Dismissing Mr. Pope's scientific theory, we observe that his position may be maintained without it. This gentleman argued that the sewage outfalls might give rise to mud-banks, even though it were difficult to prove that the mud-banks contained an appreciable quantity of sewage matter. Addressing the Arbitrators, he said: "I desire to guard myself against "the necessity of asking you to consider whether these banks "are composed of material which comes from the sewers." The learned Counsel even admitted that if he had to prove the banks to be composed of material brought down by the sewers, he "should have to meet a considerable difficulty in "accounting for so large a quantity." "But," he said, "when "you are dealing with a limited quantity of discharge, of a "character the peculiar action of which is such as has been "described, then we are dealing certainly with facts which "have arisen from the discharge of the sewage outfalls." The "peculiar action," we have already seen, is a fallacy, but the argument that the sewers can create mud-banks without infusing into such banks any large amount of sewage, is still admissible. Any check which is given to the flow of the river, whether by an abrupt bend in its course, or by the sudden entrance of a volume of water nearly at right angles, would suffice to create an eddy, and a certain amount of slack water such as would favour the deposition of earthy matter. That the large volume of water discharged into the Thames from the outfall sewers has somewhat changed the *régime* of the river is a possible thing, and the disturbance may influence the formation of shoals. But while a bank is thrown up in one place, a channel may be cut deeper in another, and it may be urged that an addition to the volume of the river at the time of the ebb is more likely to aid the scour than to increase the deposit, even though the tributary be fouler than the main stream. Mr. Pope, however, contends that the sewer outfalls have altered the character of the banks to be found in the Thames. These, he says, are no longer composed of sand or river detritus, but filthy mud, which can only be removed at considerable cost. That there was mud on the foreshore in former times, Mr. Pope admits, but he denies that mud-banks were formed in the bed of the stream until the great sewer outfalls came into existence.

The question, of course, relates to "the origin of the banks," and it will be seen that the case for the Conservators is framed very cautiously on this point. "I do not ask you to "say that these banks are composed of sewage," observes the learned Counsel; "I do not ask you to present any report "upon the question of pollution, or any of the other large "questions which are involved, no doubt, in this inquiry, and "which, sooner or later, will have to form the subject matter "of investigation." "On the part of my clients," continued Mr. Pope, "I ask you to say that these banks have arisen "from the outflow of sewage at the Metropolitan Board of "Works outfalls." Mr. Pope explained that he made use of the word "arisen" as not meaning "composed" of sewage, but as "caused" by the outfalls. "Thus," he argued, "if it "be true that the introduction of sewage does create a state "of things producing deposit where such deposit would not "otherwise have taken place, then, unquestionably, these "banks have arisen from that sewage outfall, and the parties "ought to be responsible for creating them." The argument is that the banks may be formed "by sewage," although they are not actually "of sewage."

Mr. Bidder, in his concluding address for the Metropolitan Board, given on the day preceding Mr. Pope's address for the other side, observed that the question at issue was a very simple one in its statement, but a very complicated one in its determination. The question was whether or not three banks, situated respectively at Crossness, Barking Bight, and Margaretness, were originated by the sewage outfalls of the Board. Put in more precise language, the question was: "Do these "banks arise from the sewage outfalls or from other causes, "or partly from the outfalls and partly from other causes?" Mr. Bidder made the following admission: "There is no dis-"pute in point of fact that these banks have formed, and that "they began to be apparent shortly after the opening of the "outfall sewers of the Board." It was conceded that there was a *primâ facie* case against the Board. But Mr. Bidder contended that the evidence now brought forward served to show that this was one of those cases in which it is not safe to trust to first appearances. There were the outfalls, and there were the banks, but Mr. Bidder denied that there was any connection between them. He had an explanation to give, and it was as follows, addressed to the Conservators:—"You went and dug a big channel on the opposite side of the "river, you cleared away the shoals that drove the tide into "these banks, you thereby enlarged the channel, but at the "same time you drew the stream away from them, or caused "slack water, and by causing slack water you caused deposit. "That is the whole story," said Mr. Bidder.

Of course the banks could not have come into existence without materials to form them. According to the investigations of Mr. Keates, the Chemist to the Metropolitan Board, the outfall sewage in its normal condition contains 23 grains of suspended matter per gallon, and this estimate is supported by other authorities. According to Sir Joseph Bazalgette, the average daily flow of sewage at the outfalls in the ten years 1869-78 has been 122 million gallons, containing, according to the above estimate, 184 tons of suspended matter. But it is admitted that nearly two-thirds of this quantity is organic, so that the daily discharge consists of 122 tons of organic and 62 tons of mineral matter, representing an annual quantity of 44,000 tons in the former case, and 23,000 tons in the latter. In fifteen years—which is rather an excessive period to reckon upon—the quantities become respectively 660,000 tons and 345,000 tons, the latter being the mineral matter. Mr. Bidder, quoting Mr. Hawksley's evidence, varies the figures a little, making the organic matter in fifteen years equal to 650,000 tons, and the mineral to 352,000 tons. The larger portion of the organic matter of course disappears, and it must be allowed that a considerable portion of the mineral matter is carried away seaward. As the three banks contain 1,368,000 cubic yards of deposit, equal to about as many tons, it is obvious that the figures just cited can only partially account for the formation of the banks. It must be remembered, however, that the 23 grains of solid matter per gallon consist of that which is dry, and if we add as much moisture as would bring the solid matter of the sewage to the same condition as the mud-banks, we get an increased quantity. Mr. Keates stated that, in order to raise the figures from the dry to the wet condition of the suspended matter, an allowance of 56 per cent. of water should be made. That is to say, the suspended matter, previous to being dried, contains 56 per cent. of water. This would rather more than double the contribution from the outfalls to the banks. According to the reckoning adopted by Mr. Keates, the utmost quantity of matter which the outfall sewers could contribute to the banks in the course of a year, including a due proportion of organic matter, would be 24,000 tons. If we raise this to the wet condition, we get something like 60,000 tons, which in fifteen years would be 900,000 tons. But this is supposing that everything which comes from the outfalls goes to the three banks in question, which is, of course, absurd, especially as the evidence for the Conservators tends to show that a large amount of deposit in other parts of the river is also due to the discharge from the outfalls. The period of fifteen years is likewise too long, as the drainage works have not been in full operation all this time. On the other hand, it may be said that the abnormal condition of the sewage must be taken into account as well as the normal, so as to include the extra quantity of suspended matter to be found in the sewage when a heavy rainstorm follows a dry period. Still the quantity of material is inadequate to account for the formation of the banks, and it will be seen how Mr. Pope has endeavoured to meet this difficulty by the theory that the sewage matter helped to precipitate the natural detritus floating in the river. The quantity of this detritus is large, as shown by the analyses of Dr. Tidy and Mr. Keates in respect to the water flowing over Teddington Weir. To this may be added earthy matter washed away from the saltings in the lower part of the Thames, and brought up to Barking Reach by the flood tide.

A somewhat telling argument used by Mr. Bidder had reference to the additional quantity of solid matter given to the Thames by the action of the outfalls. The flow of the river past the outfalls in the twenty-four hours may be taken approximately as 230 times greater than the volume of sewage discharged into the stream during that period. As there are 23 grains of suspended matter in a gallon of the sewage, there is thus one-tenth of a grain added to the suspended matter in each gallon of Thames water. But each gallon of the river water already contains eight grains of suspended matter, so that the actual addition is only one-eightieth of the quantity which previously existed. Mr. Bidder ridiculed the idea that eight grains would float, while eight grains and a tenth would sink. The argument depends very much on the assumption that there is a complete distribution of the sewage throughout the passing volume of the river water, which is far from being the case; but the facts, nevertheless, bring forcibly into view the capacity of the Thames for

dealing with so large a volume of sewage as that which London discharges into the stream.

This arbitration case, as it is technically called, has taken the shape of a most elaborate inquiry into the effect of the sewage outfalls on the navigation of the Thames. It seems odd that the question should simply relate to the Thames as a navigable river; but even on that footing the inquiry has served to bring out a mass of facts which cannot fail to throw light on the sanitary problem. The chemical evidence was of a very comprehensive character, and the data produced by Mr. Keates as the result of his prolonged and laborious researches will doubtless afford a valuable source of information in respect to the chemical constitution of rivers. The inquiry also marks an epoch in the history of the Thames itself, and the facts now on record, both chemical and engineering, will serve for reference on future occasions, so as to determine what changes the river may be undergoing. Concerning the probable issue of these proceedings, as embodied in the decision to be given by the Board of Trade, we can only offer speculative remarks; but, taking a fair view of all that has been urged on either side, it is difficult to conceive that the evidence can lead to any strong decision against the Metropolitan Board. To some parties it may appear as if the case for the Conservators had entirely broken down, but it seems scarcely probable that the Metropolitan Board will have a complete victory.

Communicated Article.

THE THEORY OF DISSOCIATION.

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V.

The results obtained by Würtz with chloral hydrate and potassium oxalate have been questioned not only by Troost, but by Berthelot, another keen opponent of the atomic theory. The difference between the latent heat of vaporization of chloral hydrate and that calculated from the latent heat of anhydrous chloral and of water seemed to him to indicate that chloral hydrate exists as such in a state of vapour. From his experiments, Berthelot concluded that a small amount of heat—nearly 2 calories—is disengaged by the gaseous combination of steam and anhydrous chloral to form gaseous chloral hydrate occupying 4 volumes.

Würtz then performed another series of experiments, in which he showed that anhydrous potassium oxalate took up moisture in an atmosphere of chloral hydrate at 100°. He found that when the tension of steam present was considerably greater than the dissociation tension of crystalline potassium oxalate, the mercury slowly rose in the tube, showing that under such conditions as these anhydrous potassium oxalate took up water from the atmosphere surrounding it. Würtz employed two similar tubes placed side by side and heated equally. One of them contained the vapour from chloral hydrate, the other a mixture of air and steam in such proportions that the tension of the steam was equal to the tension of the steam in the first tube if the chloral hydrate there were dissociated into chloral and steam. Anhydrous potassium oxalate was then brought into each tube, and the rise of the mercury observed in each case. It was found that the absorption was well marked, and nearly the same in both cases, thus showing that the vapour from chloral hydrate behaves like a mixture containing half its volume of steam. A similar result was obtained when an artificially moist atmosphere of chloroform and steam was used in the comparison tube.

In reply to Berthelot, Würtz actually brought the vapour of anhydrous chloral and steam in contact at a high temperature in an apparatus somewhat similar to that used by Deville in his experiments on ammonia and hydrochloric acid. The two vapours, after passing through spirals coiled round a central flask, all plunged into boiling water, meet in the flask in which is placed the bulb of a delicate thermometer, graduated in tenths of a degree C., and from which a tube conducts the mixed vapours away. At ordinary atmospheric pressure and 100° no variation in the thermometer could be detected when steam and anhydrous chloral met in the flask. The experiment was repeated under 10 mm. of mercury pressure—$\frac{1}{76}$ of an atmosphere—and at 61°, and again at 28 mm. pressure and 100°. No rise of temperature was observed in either case. Würtz found that it was necessary to work with perfectly pure chloral, for the least trace of hydrochloric acid coming into contact with steam caused a rise of temperature in the flask.

These experiments failed to convince his opponents. Berthelot, after several attacks on his adversary, published some determinations of his own, in which he found a rise of temperature on bringing anhydrous chloral vapour and steam together. In a thin glass cylinder was suspended a thin glass globe with four tubes sealed into it. Two of these tubes served to bring the heated vapours into the globe, the third dipped beneath the level of some cold water in a beaker, and the fourth allowed the bulb of a delicate thermometer to pass to the centre of the globe. A second thermometer, exactly similar to the first, was placed outside the globe, and within the cylinder; and a jet of steam was blown through the cylinder, raising its temperature and that of the globe to 100°. On now passing steam and chloral vapour into the globe, the inner thermometer rose, and remained nearly 1° higher than the outer thermometer for ten minutes, during which time some 25 grams of chloral were distilled and condensed in the beaker of cold water.

This experiment, described before the French Academy at the beginning of the present year, has just been answered by Würtz. The apparatus used by Berthelot allows drops of liquid to run down the tubes which convey the two vapours into the central globe. When liquid chloral and water, at their boiling points, come into contact, a rise of temperature ensues, the two combining with disengagement of heat. Since this heat cannot be immediately absorbed by the formation of vapour, the liquid is heated up for a few moments above its boiling point. Hence it is essential to prevent any drops of liquid entering the central flask. With this object in view, Würtz furnished his serpentine tubes with bulbs at their lower extremities, to collect any condensed liquid and prevent it flowing with the vapour into the globe. He also made them of sufficient diameter to prevent any increase of pressure, and consequent advance of temperature in the globe, which might arise from friction in narrow tubes. Through this new apparatus, heated with steam in a copper jacket, Würtz passed a current of pure chloral vapour. The thermometer marked 99·45° C. A current of steam was now sent through the second spiral, and allowed to mix with the chloral in the globe. The thermometer fell from 99·45° to 99·4°, at which point it remained constant for ten minutes. On passing steam through the globe alone, the thermometer marked 99·4°.

Other experimenters have also in recent times been at work on the question of the dissociation of chloral hydrate. Wiedemann and Schulze have submitted the vapour to diffusion, and have found it to behave like a mixture of steam and anhydrous chloral. Naumann, by careful fractional distillation, has succeeded in getting two liquids richer in water and in anhydrous chloral respectively than the hydrate distilled. Moitessier and Engel have also made a very systematic study of chloral hydrate. In the first place they showed that when the hydrate was heated to its boiling point in the closed end of a U-tube over mercury, the tension of the vapour produced was greater than that of the atmosphere—a fact most easily explained on the supposition that the vapour was a mixture. Shortly afterwards the same chemists published a new method of distinguishing between a simple vapour and a mixture. Their idea was to distil chloral hydrate with a volatile substance, which in the liquid state only dissolves one of the products of dissociation. Chloroform, they found, answered the purpose. On distilling well-dried chloroform and chloral hydrate in a retort, a turbid distillate was collected, which, after standing, separated into a layer of chloroform, holding anhydrous chloral in solution, and into a layer of water, which gradually became charged with chloral hydrate by reacting with the anhydrous chloral in the chloroform below. By continually drawing off the chloroform from the bottom of the condenser, the recombination of the chloral and water was almost entirely prevented; and on allowing the distillation to proceed with fresh supplies of chloroform, nearly all the water originally in the hydrate was separated. Moitessier and Engel conclude that at 61°, the temperature of the experiment, chloral hydrate is completely dissociated in an atmosphere of chloroform vapour. By a second series of experiments, they have showed that at 47° chloral hydrate is completely dissociated in an atmosphere of carbon bisulphide. Neither boiling chloroform nor boiling carbon bisulphide has any chemical action on chloral hydrate. Having verified the fact of the dissociation of chloral hydrate when volatilized, Moitessier and Engel examined the effect produced by heating the hydrate in the presence of one of the products of its decomposition. When the hydrate was heated in a tube at 100°, which already contained the vapour of anhydrous chloral, it volatilized, and its vapour was found to have a density corresponding with 4 volumes—*i.e.*, it was completely dissociated into anhydrous chloral and steam. This was found to be the case so long as the tension of the atmosphere of anhydrous chloral was *less than the dissociation tension of the hydrate.* A similar dissociation took place when the hydrate was heated in an atmosphere of steam, the tension of which was *less than the dissociation tension of the hydrate.* At 60° anhydrous chloral has a tension of 212 mm. of mercury, whereas chloral hydrate has a tension of only 146 mm. at this temperature. When some chloral hydrate was introduced into a tube containing anhydrous chloral vapour at a tension of 200 mm. and at 60°, the level of the mercury remained unchanged. The hydrate neither decomposed nor volatilized in the presence of one of the products of its decomposition at a tension greater than its own dissociation tension. Again, into the tube containing anhydrous chloral vapour at a tension of 200 mm. and 60°, a small drop of water was introduced. The mercury rose in the tube, showing that the water and anhydrous chloral had entered into combination, the hydrate being a stable, unvolatile body under the conditions of the experiment, where the tension of the anhydrous chloral in the tube was greater than the tendency of the hydrate to decompose.

The dissociation of ammonium sulphydrate into ammonia and hydrogen sulphide, a fact of some interest to gas managers, has also been experimentally determined by Moitessier and Engel. Ammonia and hydrogen sulphide will unite at low temperatures in equal volumes to form ammonium sulphydrate—a crystalline solid. When dry ammonia and hydrogen sulphide were brought together over mercury at 50° C., no contraction took place. A piece of charcoal, previously ignited, was now passed up into the vessel. An absorption of gas by the charcoal took place, till about one-quarter only of the original volume of gas remained. The charcoal was then removed and passed into a vacuum over mercury. On heating the end of the tube the absorbed gases were expelled from the charcoal,

which was then removed. The gases so expelled deposited crystals on the side of the tube as it cooled. The residue consisted of free ammonia, for it was completely absorbed by pumice soaked in sulphuric acid. The gas left in the first vessel after the removal of the charcoal also deposited crystals on cooling. The residue was not absorbed by sulphuric acid. It appears that ammonia and hydrogen sulphide do not combine at 50° C.—in other words, ammonium sulphydrate is completely dissociated at that temperature; for charcoal absorbs more ammonia than hydrogen sulphide when placed in a mixture of equal volumes of these gases, whereas if combination had taken place equal volumes of the two gases would have been taken up. These chemists have also shown that water will serve to separate ammonia from the dissociated gases. Into a mixture of ammonia and hydrogen sulphide, in a tube over mercury at a low temperature, a few drops of water were introduced, and the whole of the gas was absorbed. Into a similar mixture at 50° a few drops of water, previously heated to 50°, were introduced, and only a portion of the gas was dissolved. On transferring the residue to another vessel it was found to be nearly pure hydrogen sulphide. Again, on gradually warming the solution formed by treating the two gases with water in the cold, hydrogen sulphide was first disengaged in a nearly pure state. As the readers of the JOURNAL are aware, this separation of ammonia and hydrogen sulphide by hot water is employed in Hills's process for revivifying gas liquor. The liquor, heated a few degrees below 100°, gives off most of its carbonic acid and hydrogen sulphide while it retains most of its ammonia, and when sufficiently *causticized* is employed for absorbing more carbonic acid and hydrogen sulphide from crude gas.

Such are the experimental facts. It would be difficult to imagine much stronger evidence in favour of the dissociation of vapours which have an abnormal density, than the experiments which have been described at length in these papers. Nevertheless, Deville, Berthelot, and Troost maintain their attitude of hostility to Avogadro's law, and refuse to consider dissociation as the explanation of all cases of abnormal density. "I admit," says Deville, "neither the law of Avogadro, nor atoms, nor molecules, nor forces, nor particular states of matter. I absolutely refuse to believe everything that I can neither see nor even imagine, and I declare my position to be unaffected if every complex body is decomposed before it is vaporized. You must prove it to be so."

There are, as we have seen, very few facts in favour of the view that any molecule in the state of vapour can occupy four times the space occupied by an atom of hydrogen. The facts most relied on by the opponents of Avogadro's law are those connected with the vapours of ammonium salts. It seems to be established that when an ammonium salt is volatilized, it can withstand a temperature at which ammonia by itself suffers a partial decomposition; and that when hydrochloric acid and ammonia are brought together at the boiling point of mercury a slight rise of temperature is produced. But these facts are not inconsistent with the truth of Avogadro's law; the presence of hydrochloric acid in the immediate neighbourhood of the molecules of ammonia may preserve their stability although actual combination does not take place, and the slight rise of temperature may be due either to a very small fraction of the mixed gases entering into combination, or to some physical action between the separate molecules. An addition of water to sulphuric acid already diluted with 60 equivalents of water causes a slight rise of temperature. Does this rise of temperature indicate that a more complex molecule is formed by a chemical reaction between a molecule of water and a molecule of a hydrate of sulphuric acid containing 60 equivalents of water? Thus:—

$$H_2SO_4, 60\,H_2O + H_2O = H_2SO_4, 61\,H_2O.$$

The bond of union between the hydrate and the sixty-first molecule of water may differ not in kind but only in degree from that between a molecule of sulphur trioxide and a molecule of water; but it is more probable, as Favre has pointed out, that the disengagement of heat is due to a molecular attraction different from chemical affinity; that the molecules of sulphuric acid and water do not unite and condense themselves into a true molecule, but act on one another at a distance. It may be that a similar reciprocal action takes place between the molecules of hydrochloric acid and ammonia when mixed together at 350°, and that the effect of this attraction is to increase the stability of the two molecules. It is unnecessary to suppose that the molecule of ammonium chloride can exist as a stable compound in the state of vapour.

SALE OF SHARES IN THE REDHILL GAS COMPANY.—Last Wednesday five £5 shares in the above-named Company were sold by auction, and realized the large sum of £65, being 160 per cent. premium.

LITTLEHAMPTON WATER SUPPLY—The Littlehampton Local Board of Health having applied to the Local Government Board for a loan of an additional £9000 for the purposes of water supply, Mr. Arnold Taylor, one of their Inspectors, held an inquiry on the 25th ult. into the application, to which there was no opposition. In the course of the inquiry it transpired that the total yield of water from the local wells is now 118,000 gallons per day.

THE AWARD IN THE HEYWOOD LOCAL BOARD WATER-WORKS ARBITRATION.—Our readers may remember that at the end of last year we noticed the proceedings in the arbitration commenced to determine the amount of compensation to be paid to Mr. Hutchinson, of Green Booth Mills, near Rochdale, for the water taken by the Heywood Local Board under their Act of 1877. Mr. Hutchinson claimed £66,000. He alleged that his water had been reduced from an average of 7½ feet per second to 4½ feet per second, and claimed compensation for this and other losses. The points raised were, first, the value of the water as power; secondly, the value of the alterations made at his mills so as to enable him to work as he did previously; and thirdly, the value of certain portions of land which he has lower down for erecting manufactories. The award was received at the last meeting of the Board, the Arbitrator (Sir Henry Hunt) settling the amount at £12,000.

Correspondence.

[*We do not hold ourselves responsible for the opinions expressed by Correspondents.*]

SPENCE'S METALLIC COMPOUND AND ITS USE FOR PIPE-JOINTS.

SIR,—I am sorry that your correspondent, Mr. J. L. A. Hope, should think my letter, on the subject of "Spence's Patent Metal," addressed to the Secretary of the Society of Arts, and referred to by you in your issue of the 2nd of March, "calculated greatly to mislead . . . . the Engineers of the various Gas Companies of England." I wrote, as the letter itself says, "in the interests of my professional brethren," the very gentlemen Mr. H. desires should not be misled. I know that from them at least I get credit for honesty of purpose in so doing. In my letter I unfortunately used the word "pipes" instead of "joints;" but doubtless all who read it, including Mr. H., knew very well what was meant. I would repeat that about half of the joints were "made under the immediate supervision of Mr. Spence's representative, and not one of them stood the test." They were made precisely as Mr. H. says those which he tried were made—two at least of the number under Mr. Spence's own eye.

It is only just, perhaps, to state that when Mr. Spence saw the result, he said he thought there was somethin ; wrong with the "metal," that he would take it (about 10 cwt.) away and replace it. That was on the 11th of February, on the evening of which day the "metal" was introduced to public notice at the meeting of the Society of Arts, and since which time I have not seen or heard from Mr. Spence. R. MORTON.

London Gaslight Company, Nine Elms, S.W., April 5, 1880.

SIR,—Mr. Morton's experiments having been called in question by your correspondent, Mr. J. L. A. Hope, I feel constrained to relate my experience with regard to Spence's metallic compound.

On hearing of the success which had attended its trial elsewhere, I made preparations for jointing up about 150 yards of 24-in. main, which it so happened that I had to lay, for a temporary purpose, above ground. The work was begun under the immediate supervision of Messrs. Spence's representative, who, on leaving, expressed his entire satisfaction. Since its completion it has been tried under a gas pressure equal to 4½ inches head of water, with the result that every joint leaks—the loss as registered through a meter amounting to 48 feet per hour, or at the rate of 1152 cubic feet per day of 24 hours.

In addition to this, some shorter lengths of 4-inch and 12-inch pipes were jointed up, also under the superintendence of Messrs. Spence's representative, and with a similar result. Not a joint was found to be sound under a gas pressure equal to 6 inches head of water.

Birmingham, April 2, 1880. CHARLES HUNT.

THE RECENT TRIAL AT MANCHESTER OF WEST'S AND FOULIS'S SYSTEMS OF DRAWING AND CHARGING RETORTS.

SIR,—The number of the JOURNAL for the 23rd of March, I notice, contains letters from Mr. Foulis and Messrs. Woodward and Sons, respecting the comparative trials recently made with Foulis's hydraulic machinery and my apparatus at Manchester. As these letters contain misrepresentations, I suppose with a view to disparage my system, I am bound to answer them.

Mr. Foulis considers the results are hardly to be credited. Other engineers of eminence have also been surprised at the results I have obtained from time to time during the last two years; but, after visiting Maidstone and other places where my apparatus is in operation, have been fully satisfied that the improved mode of working has been the means of producing these results. Mr. Foulis admits that he has never claimed to make more gas per retort, or increase the yield per ton of coal, and gives as his opinion that it cannot be affected to any great extent by machinery, and that his only endeavour was by machinery to relieve the heavy work of gas-making so as to save both labour and money, &c. It will be observed that Mr. Foulis admits he has only been trying to save labour and money by his machinery, in which endeavour he is to be commended; but the question arises, has he succeeded in either?

It is well known to the gas world that ponderous and very expensive machinery, actuated by steam and other power, for drawing and charging retorts, has been invented and tried in large works, but in no case has been found able to charge the retorts equal to hand labour, either for efficiency or economy, and has, I believe, in every instance, except in Manchester, been discontinued. Even at Beckton, where, I believe, the hydraulic stoker was worked under the direct supervision of Messrs. Woodward and Son, its use has been given up; and according to the information I have received from several sources, the apparatus has not been introduced at the Glasgow works (the home of the inventor), except to a very limited extent, and I heard very recently that the whole of these works were again on hand-charging. I claim, by the aid of my machinery, to produce more gas per ton of coals, of higher illuminating power, and at less cost for machinery and plant than the old system, at the same time effecting a great saving in labour, and after years of study and costly experiments I have succeeded beyond all expectations, and a long period of practical working has more than confirmed the correctness of my experimental results.

Mr. Foulis fails to see how the extra volume of gas was obtained. Now, it is well known by all engineers and chemists who have experimented with coals in the laboratory that, on account of the care bestowed in breaking and spreading them evenly over the surface of the retorts and distilling them rapidly, a larger volume of gas of higher illuminating power is obtained than can be produced in practice on the old plan of working. Knowing this from experience, I resolved to try and make gas on as scientific and simple a plan in the retort-house, and first began by preparing my coals for more perfect distillation by breaking them, and afterwards, with my machine, spreading them in a perfectly even layer over the flat surface of D-retorts. In this way I was enabled to obtain just the same results as in the laboratory experiments. The work of breaking is done by a specially-designed

coal-breaker and engine combined, which receives the coals direct from the waggons or carts, and breaks, elevates, and delivers them into hoppers directly in front of the stacks, at the desired height required for charging each row of retorts—this heavy work of breaking and lifting being done by steam or other power.

I think, after what has been stated, that the gas world should know more clearly upon what conditions my apparatus was introduced, and the special arrangements made for carrying out these extensive comparative trials at Manchester. I will, therefore, give a brief outline of what has been done, knowing that the large circle of Engineers and friends to whom I am personally known will accept them as a statement of facts, which can also, if necessary, be further corroborated by referring to the Gas Committee of the Corporation of Manchester.

The Committee in the spring of last year decided to visit London and Maidstone for the purpose of inspecting gas-works, and ascertaining if there were any improvements in apparatus for making purer and cheaper gas. Fifteen of these gentlemen inspected the working of my apparatus in minute detail. They at once saw that the heavy work was accomplished by the machinery as before described, and that my light-charging machine, which runs into the retort upon three wheels, does away with the necessity of using heavy and expensive machinery for this purpose. After their visit they decided to substitute my apparatus for Foulis's machine in No. 1 retort-house, at the Rochdale Road works. The retorts, benches, and chimneys being in a very dilapidated state, a large portion had to be rebuilt. New D-retorts, ascension-pipes, and mouthpieces were provided, and White's valves supplied, but there was not to my knowledge, as your correspondents assert, any additional rails laid for the coal stores in connection with this house. The Committee resolved that my apparatus should be thoroughly tested, and arranged to detach No. 1 house from the other part of the works. This was done by an alteration in the exhauster-house, the addition of two Livesey's washers, and the raising of the tower scrubbers (which had to act partly as condensers), one set of old purifiers and one of the four meters completing the arrangements.

To avoid any misunderstanding, the Committee had special instructions prepared for those gentlemen who had charge of the comparative trials, which, for securing accuracy of results for experiments of such magnitude, could not be improved, and they reflect the greatest credit upon the Gas Committee of Manchester. Besides the officials on these large works, they had others from the Gaythorn station, and a staff of clerks from the Town Hall, and in all cases two sets were employed to take observations and fill up the special forms provided, and these were sent under seal to Mr. Jackson at the Town Hall each evening, signed by those in charge of the experiments.

It was decided that six kinds of cannel and coal should be used, and arrangements were made with the Railway Companies and Colliery Proprietors for the delivery of about 800 tons per day, which were to be distributed in equal proportions of weight and quality in the coal stores connected with each system under trial. All the coals in stock were previously whitewashed.

The charges for carbonizing for each system were to commence after the coals were tipped from the railway waggons into the stores, and included all expenses until the coal was tipped and quenched in the yard.

The illuminating power was taken by four experimenters as frequently as possible with a new 60-inch Letheby-Bunsen photometer (made by Alexander Wright and Co.), and the test-burner used was the London standard 20-candle bat's-wing.

All the meters and valves were sealed, and, finally, the connections were severed in the engine-house, so as to isolate the exhauster for No. 1 house.

The indices of the station-meters, together with the temperature and the barometric pressure, were taken hourly, night and day.

The number of foremen and men employed, together with wages paid, were taken daily, and the actual time occupied in drawing and charging the retorts was carefully noted, and the results turned out as you have recorded in the JOURNAL for March 16.

Messrs. A. Woodward and Sons, Engineers, of Manchester, are the representatives and makers of Mr. Foulis's hydraulic stoker, and being on the spot for the last five years, have had unlimited right of entrance to the works during the whole of the time, for the purpose of inspecting, repairing, and improving the apprratus, and have been coaching it along and keeping it in repair until recently. Mr. Woodward is still a frequent visitor at the gas-works, often has men working there, and during the erection of my machinery made a number of inspections. Some one has also been actively writing upon the subject to a member of the Committee, and some of the Committee have received a statement of what was supposed to be an accurate account of the comparative working of the two systems. This was circulated before my apparatus was completed, but those who concocted it were ashamed to, or dare not attach their signatures to such a misrepresentation. The Committee, however, have some clue to the perpetrators.

It should also be mentioned as to these experiments, that it had been known for months past that they would be made when the winter season was over, and the Committee, the Manager of the works, and Messrs. Woodward and Sons had naturally been doing all in their power to get the three houses in as perfect a condition as possible, and everything was in very good order for gas-making. When the Committee decided the day for commencing the trials, I suggested that Messrs. Woodward and Sons be officially invited to be present. They were there when the operations commenced, and it was observed that the experienced skilled men at Foulis's machines displayed an amount of activity seldom seen in workmen; and no wonder, for they were especially interested in securing good results, and the returns prove that they did their very best, as the figures far exceed anything obtained during the whole of the previous five years working. It must also be understood that the Manager and officials of these works have had years of experience of its working, and these were not consulted as to the desirability of adopting my apparatus. It is also well known that a large majority, if not all, used their influence on the side of the Manchester-made machinery. Against this great force, occupying a fortified position, I had to manipulate in No. 1 retort-house with men employed on the works. These had to be trained, and for this purpose I had a foreman and four men in each gang, and although some of these men had been working my apparatus for weeks, after the first day of the experiment my working was upset by the Corporation men demanding certain concessions, and, to my surprise, based one of their demands on an increase of wages that had been given, without my knowledge, a short time previously, to the hydraulic stoking men, who, they stated, were receiving at the rate of 7s. 6d. per day, whereas they (the men employed with my apparatus) were only getting 5s. The Committee discharged all these men, and the retorts stood for ten days. The stokers, however, asked to be taken back, and I reorganized my plan of working, knowing that it could be well afforded. I gave them very light work, the firemen having only to attend to five fires each. On re-commencing the experiment, I found the retorts had suffered considerably, all the joints being open, and very much cracked. These, however, were stopped, and after working under pressure a few days we got them quite tight.

It is also suggested that I had an advantage by the adoption of White's valves, but I regret to say that I could not get the advantage of this valuable adjunct to the retort-house in consequence of the defective state of the exhauster, which compelled me to work with an excess of pressure on the retorts.

Much more might be said, but I am afraid you will think my letter already too long. In conclusion, I wish to state that when I first contracted with the Corporation for the supply of my apparatus, I had no idea the Committee would call upon me to so minutely compete with the hydraulic machinery, seeing that they had already had some five years experience of its working under varying conditions. The Committee, however, decided that thorough and complete comparisons should be made between the two systems, and to this, of course, I had not the slightest objection, knowing that it would give me another opportunity of demonstrating the advantages of my apparatus; and I may say, further, that with my long practical knowledge of the working of my apparatus, I have no hesitation in guaranteeing that by the use of my system, the ordinary working results over a long period will be fully equal to those obtained during the Manchester experiments.

Maidstone, April 3, 1880. JOHN WEST.

THE RECENT GAS-LAMP TESTS AT BIRMINGHAM.

SIR,—Mr. Hunt has kindly called my attention to an unintentional inaccuracy in my letter of last week in the paragraph mentioning the high result, per cubic foot of gas, he had obtained with one of my Argand burners in his experiments. It was not, he says, 4·5 candles per cubic foot of gas consumed, but 4·32 candles, and the gas was not 16-candle, as I stated, but 16·75-candle gas.

I regret, with regard to the latter correction, that the present standard of comparison, the spermaceti candle, does not permit us to speak with nearly that scientific accuracy which is desirable in relation to the standard illuminating power of any gas. What I meant by 16-candle gas was a gas such as is usually considered 16-candle gas, and which may be, and in fact generally is, a fraction of a candle more.

As it was the same quality of gas that he (Mr. Hunt) used for testing both Argand and bat's-wing burners, the comparison between them will remain the same, so far as the quality of the gas is concerned—viz., whether it was 16 or 16·75-candle gas—but, with regard to the effect of the correction on the illuminating power obtained, per foot of gas consumed, I have to say that, in making my comparison, I did not, for fear of lengthening my already very long letter, claim the deduction from the result obtained by the bat's-wing burner which I might have done—viz., at least 10 per cent.

In making accurate comparisons between the photometrical results obtained from Argand and bat's-wing burners, a correction must be made so as to neutralize the error in the readings of the divisions on the photometer-bar, which is always in favour of the bat's wing. One part of the theory on which the divisions on the bar are based assumes that the light from the burner or candle under examination shall equally illuminate every part of the circumference of a circle drawn round about the burner or candle as a centre, the distance between the burner and the disc being the radius of the circle. The Argand, being a circular sheet of flame, fulfils this condition; but the bat's-wing, being only a sheet of flame across the diameter of a circle, does not. The greatest amount of light is given with the flat of the flame to the disc, but this is always the position of the bat's-wing flame during the course of experiments.

According to my estimate of the magnitude of the error caused by the loss of light in every other direction, in the instance in question, the proper correction made will leave the comparison of light obtained, per cubic foot of gas consumed by each of the burners, very nearly as stated in my letter, the true difference between the two burners being 35 per cent. instead of 30 per cent.

I regret, however, very much that I came away with a wrong impression of the results Mr. Hunt obtained. The reason probably is that when I heard his statement, I suppose my attention was too much attracted to the fact that he had obtained in a simple manner what I thought at the time was a similar result to those obtained, independently of each other, by Mr. Heisch, Chief Gas Examiner to the Corporation of the City of London, and myself, but in two other different ways—Mr. Hunt shortened the chimney; Mr. Heisch slightly increased the consumption of gas per hour over what I had fixed for the quantity to be consumed; while I have been working for a long time to obtain a like result by increasing the supply of atmospheric oxygen, without increasing the quantity of gas, and without altering the chimney. I have already succeeded in so far improving the original 80-candle burners used in Waterloo Place and Queen Victoria Street, by a re-arrangement of both the air and gas supply, that with 4 or 5 feet (according to the quality of gas) increase in the original hourly rate of consumption I have produced 100 instead of 80 candles. The knowledge of these facts led me, I feel certain, to believe that Mr. Hunt said 4·5—a similar result to that obtained by Mr. Heisch and myself—instead of 4·32 candles.

I never intended, either, to convey the idea that the gas supplied to Birmingham was only equal to just 16 candles. On the contrary, the mention of the fact that the gas in the town is tested by the same standard burner (viz., the Gas Referees burner) as the gas supplied to

the City of London, will at once lead your readers to the conviction that, to keep it well over the standard, the Corporation necessarily give about 17-candle gas.

Vincent Street, Westminster, April 2, 1880. WILLIAM SUGG.

SIR,—I have to ask for a little indulgence while I make a few further remarks on the above subject. I will not argue with your correspondent when he attempts to explain away that part of the Birmingham tests which tell in favour of my apparatus and against his own—the Birmingham authorities will be able, no doubt, to defend their experiments. The position which Mr. Sugg appears to wish to support is the one he took up some time since, when he staked his reputation on the statement that his Argand burner and shadowless lantern was the best system for street lighting for "common and cannel gas;" and that it would yield "over 30 per cent. more light than any other with the like consumption of gas." I, on the other hand, staked my reputation on the statement that "the flat-flame was the only practicable burner for street lighting," and that it would yield, "in actual use, as much light as the Argand with common gas, and more with cannel gas."

As Mr. Sugg often quotes from burner tests to prove his case, I will here quote the following from the Birmingham tests:—

	Candles per Foot.
Sugg's best 80-candle Argand was shown to yield . .	3·41
Bray's medium lighting power, 80-candle clusters . .	3·01
Bray's high lighting power, 80-candle single burner (the result given in by Mr. Hunt)	3·51
Sugg's 200-candle Argand	3·95
Sugg's 200-candle flat-flame, tested to give 200-candle power	3·04
The same burners tested at very low pressure	3·24

From this it is seen that the best 80-candle Argand does not equal my best 80-candle flat-flame, and that the latter is only 11 per cent. below the 200-candle Argand. This result, being with common gas, is the most favourable for the Argand, as it is obtained from common gas, and without any deductions for the defects which I shall mention shortly, and which lessen the lighting power immediately the burner is put into use. The flat-flame burners shown by Mr. Sugg, which are an imitation of our lamp burners—*i.e.*, such as we introduced in the beginning of last year, of the slit-union type of large capacity and lighting power—yielded, when doing best, 9 per cent. less than our high lighting power burner. Therefore, whatever superiority Mr. Sugg's Argand shows over my flat-flames, beats his own considerably more.

As to the lamp tests, it is important to note that the lantern in which the Argand was tested was not the Sugg shadowless, but the globular one designed by Mr. Hunt, which yields a much greater amount of light. When thus favourably tested, and both apparatus rated to consume exactly 46·75 feet of gas per hour, the lights were shown to be equal when the shadow meter was 73 ft. 2 in. from Bray's flat-flame lantern, and 76 ft. 10 in. from the Sugg Argand lantern. Only the side light was tested; and when your correspondent is reminded that the disc was protected on each side by a funnel, he will see that his statement to the contrary cannot be correct.

The above results, with both burners and lanterns, though the tests were with common gas, which is favourable to the Argand, do not support Mr. Sugg's statements, and if he can see anything of victory in them it must be of the nature indicated by Napoleon I., when, after a noted battle of another kind, he exclaimed, "Another such victory, and I am undone." The results are, however, more favourable to the writer than those he bases his calculations upon for the statements he makes regarding the light of flat-flames as compared with Argands in actual use.

I am not going to charge Mr. Sugg with doing it purposely, but by drawing public attention exclusively to the lighting value of his apparatus, as tested by ordinary photometric means, he keeps out of sight the main portions of the subject. The most important matter is the practical utility of the apparatus; and on this point Mr. Sugg is completely silent. Nor does he make any allowance for the diminished lighting value of the Argand, when brought into actual use, caused by the lack of top and bottom light, which amounts to nearly 20 per cent.; nor for the fact that it cannot be governed to work within 10 per cent. of its best, because of its sensitiveness to the slightest increase of pressure; nor for the chimney becoming smoked, or becoming partially opaque by use when it does not happen to break. These grave defects he never touches upon in his letters, though I have repeatedly pointed them out to him; and he never makes allowance for them in his published statements.

As I wish to give Mr. Sugg every opportunity to satisfy himself regarding my apparatus, and as I do not intend to have much correspondence, I will say, once for all, that if he disputes the correctness of the Birmingham tests, I am prepared to make a joint application with him to Mr. Hunt to be allowed to test ourselves any points he may wish.

I am obliged to Mr. Sugg for his offer to allow me to test my apparatus against his on his photometer, &c., but the obligation would have been greater had the offer been made in more considerate language. I must remind him, however, that there is an offer still open which I made at the Paisley gas apparatus exhibition. I should like to know if he gives up the thought of attempting to prove his case with Scotch gas. I may say also that I have an apparatus for testing lanterns, burners, &c., and Mr. Sugg might make tests upon it without having to ask the favour of any person but myself to do so. If he will come to Leeds to have the tests made, and pay half the cost of any alterations that may be necessary for the test, and half the fees of the adjudicators, I should be glad to take part in such an arrangement. Or if he declines to come to Leeds, I will pay half the costs of apparatus, &c., in any convenient place that may be mutually arranged for. I think now there appears to be some prospect of this dispute being settled in a manner that will add to the knowledge of the profession and the public, and to the dignity of the parties contending.

I have also to say a word about the flat-flame burners and lantern shown by Mr. Sugg at Birmingham, of which he has promised to send you a sketch. This apparatus is in all its essential features an infringement of my first lamp patent, No. 1454 of 1879, and is to be found in my drawings almost exactly as Mr. Sugg has produced it, and every part is distinctly specified. I should not have alluded to it here had he not taken this step to make the matter public. I am surprised that he has done so before giving me his views, seeing that I have communicated with him personally before taking the necessary legal steps to protect my rights.

Blackman Lane, Leeds, April 3, 1880. GEO. BRAY.

P.S.—I find I have omitted to give credit to Mr. Sugg's Argand for a result Mr. Hunt appears to have obtained, which was not published, but which Mr. Sugg mentioned in his letter. The result is higher than has ever before been announced, and, if verified, I shall rejoice to hear of this further achievement in the gas industry.—G. B.

Legal Intelligence.

LIVERPOOL BOROUGH SESSIONS.—THURSDAY, APRIL 1.
(*Before Mr.* J. B. ASPINALL, Q.C., *Recorder.*)

APPOINTMENT OF A PUBLIC ACCOUNTANT OF THE LIVERPOOL CORPORATION WATER ACCOUNTS.

An application was this day made for the appointment of a competent Accountant to examine the Liverpool Corporation water accounts, pursuant to the Act 10 & 11 Vict., cap. 261, sec. 127.

Mr. SEGAR (instructed by the Solicitor to the Liverpool Land and House Owners Association) appeared for the applicant, Mr. John Murphy, the Secretary of the Association; Mr. M'CONNELL (instructed by the Town Clerk) appeared for the Corporation.

Mr. SEGAR said he had to make an application, under the Act named, for the appointment of a competent Accountant to examine the Liverpool water accounts, an abstract of which had been filed with the Clerk of the Peace. The application was made at the previous sessions, but the abstract not then having been filed, the Recorder had directed that the application should be renewed these sessions.

Mr. M'CONNELL opposed the application on the ground that the accounts having been made out could be inspected by any ratepayer, and that it was unnecessary to have an Accountant appointed.

The RECORDER said he considered he would be justified in appointing an Accountant, as he had frequently done so in the case of the Gas Company upon the application of the Corporation. He did not quite see how the Corporation could fairly object to the application, considering that they annually applied in the case of the Gas Company, and no complaint was made as to the expense the appointment of an Accountant necessarily involved. He (the Recorder) thought the consumers of water had as much right to have the accounts examined as consumers of gas, and he considered that the Corporation had been fortunate in not having previously had their accounts examined. He would make an order for the appointment of Mr. M'Quie. The order could be drawn up by the parties and submitted to him on the following day.

EASTBOURNE COUNTY COURT.—THURSDAY, MARCH 25.
(*Before Mr.* A. MARTINEAU, *Judge.*)

THE LIABILITY OF WATER COMPANIES FOR ACCIDENTS CAUSED THROUGH BROKEN MAINS.

In the JOURNAL for Nov. 25 last year, a report was given of the hearing of a case in which a fly proprietor named Bylett summoned the Eastbourne Water-Works Company for damage to his horse and consequent loss of time, the amount claimed being £50. The evidence then given was to the effect that plaintiff was driving down Devonshire Place on Oct. 3, when his horse stumbled, and on examining the ground it appeared that the road had given way under the tread of the horse. The plaintiff alleged that, owing to the Water Company's pipe being leaky at that particular spot, they were liable to the damages claimed, as the water had washed away the subsoil and left the crust, on which the horse unfortunately trod. At the first hearing a question was raised as to the liability of the Local Board, and his honour gave leave to amend the summons by making them co-defendants.

Mr. E. JONES again appeared for the Water Company; and Mr. J. H. C. COLES was instructed on behalf of the Local Board.

Mr. JONES reminded his honour that after all the evidence had been tendered at the October sitting of the Court, he thought it desirable to adjourn the case, in order that the Local Board might be made parties to the cause.

Mr. MARTINEAU: I certainly thought there was no liability on the part of the Water Company, but before I said so I suggested that the Local Board should be joined to the Company as co-defendants. I thought in this way it might be shown who was responsible, and my suggestion has been carried out.

Mr. COLES: That has been done, but we have not received particulars.

Mr. MARTINEAU said since he had given that decision his attention had been called to a case in the law reports against the Mayor of Carlisle, in which the question was as to whether the Local Board, on whom the duty devolved of repairing a road, were liable to an action by a person who had suffered damage, as he alleged, by their negligence. It was held in this case that the liability cast upon the Board must be proved in the same way as against a parish—namely, by indictment. It might seem very hard on a person who was seriously injured by somebody's negligence that he could not obtain redress; but the section was exceedingly clear upon the point.

Mr. COLES: It may save time if I here take a preliminary objection that we have received no notice of action.

Mr. MARTINEAU said the Water Company maintained that they had done their duty in reinstating the road, and he did not see any evidence of negligence on their part. But when he made the two parties co-defendants, he thought the Local Board and the Company might fight out the matter of liability between them. He should not have made the suggestion had it at the time occurred to him that the plaintiff's only remedy was by indictment. He thought the rules about motions were essential, because it would be exceedingly hard on public functionaries, unless they had an opportunity given them of making amends for any injury, supposing they were liable. He did not think the defence was exactly a technical objection, but rather a substantial one.

Mr. LAMB said he could not see that it was too late. If it was necessary for the notice to be given, he still had a month.

Mr. COLES: No, you have not. The case was first heard in October last, and the six months will be up.

Mr. MARTINEAU said he was of opinion that, as far as the Water Company were concerned, they were not liable; and, as to the Local Board, the objection raised by Mr. Coles was a fatal one. He should, therefore, give a verdict for the defendants in each case, and was sorry to say with costs, for it was really a hard case.

Mr. LAMB: I should have liked to have argued the question of liability.

Mr. MARTINEAU: I should have very much liked to have heard you, Mr. Lamb. It is a much more interesting point of law than often comes before a county court.

Miscellaneous News.

METROPOLIS WATER SUPPLY.

Lieut.-Col. Bolton's report on examinations made of water supplied by the Metropolitan Water Companies during the month of February, though dated the 10th ult., was not issued till last Wednesday. In it he says that the state of the water in the Thames at Hampton, Molesey, and Sunbury (where the intakes of the West Middlesex, Grand Junction, Southwark and Vauxhall, Lambeth, Chelsea, and East London Companies are situated) was good from the 1st to the 8th of February, when it became very turbid, and remained in a bad condition until the 25th; it was then indifferent in quality, and continued in that condition for the remainder of the month. The highest flood state of the river at West Molesey during the month was 5 ft. 8 in. above summer level, and the lowest 3 inches above summer level; the rainfall being 1·90 inches. The water in the River Lea was generally bad during the month. [These remarks refer to the condition of the water previous to filtration.] The water at all the intakes was in very bad condition during the month. The filtration was, however, generally efficient, the water supplied by the Companies having been clear, bright, and properly filtered, except as regards the Lambeth and Grand Junction Companies, who for a few days delivered water of a slightly turbid character, as, pending the completion of the works now in progress by them, they have not the means of properly dealing with the water from the Thames in times of such heavy floods as prevailed during the month.

The report then goes into details in respect to the several Companies, as follows:—

Kent Water-Works Company.—During the year 1879 this Company extended the constant supply to about 1000 houses, making the total number under constant supply 13,777. The Company have completed the construction of a covered reservoir at Farnborough to hold 1,400,000 gallons, and have made considerable progress with the new pumping-station in the same parish. The mains to connect these new works with the Metropolitan district are completed. A duplicate main, 14 inches in diameter, has been laid down between Plumstead and Greenwich.

New River Company.—During the year 1879, 3352 additional houses were laid on, 199 of which were furnished with a constant supply, and 1433 houses formerly supplied were pulled down for street improvements. The total number of houses having supply at the close of the year was 129,554, and of these 15,133 (being inhabited) had service on the constant system. Three of the five new filtering-beds at Hornsey have been completed and set to work. The borings at Ware and Turnford, having both secured the means of further water supply from the chalk, were carried through the gault and through thin beds of lower greensand. They then entered, and were respectively terminated in Upper Silurian and Devonian rock. The sinking of the new well at Enfield for further supply from the chalk has been carried down to a depth of 110 feet. The ordinary extensions of the Company's pipes in various directions during the past year have added about 8 miles to the length of pipes, and raised the total to 704 miles, exclusive of 15 miles of special extensions laid, but not yet in use. 631 additional hydrants were fixed during the year. This Company are quite prepared to give constant supply when called upon to do so by the Public Authorities, and are giving it to 15,143 houses in their district.

East London Water-Works Company.—This Company give constant supply to 100,848 houses out of 122,746 houses supplied by them. During the past year they have laid on 3633 new houses, and have transferred 8829 houses from the intermittent to the constant system. The Company have been engaged in the re-construction of one section of their filter-beds on more approved principles, and it will contribute to the greater purity of the water supplied, as evidenced by the analysis for January, one bed having been at work for some time. During the past year the Company have completed the construction of, and have now in use a large tank at Buckhurst Hill capable of containing 7000 gallons. This is kept in reserve in case of fires at night, or when the engines are not at work, being situated on the highest ground in the above neighbourhood, and placed at a sufficient altitude to command the houses around. The Company are rapidly proceeding with the construction of a set of four filters and two 100-horse power engines at Lea Bridge, which will be put in use during the month of May, and be then enabled to meet any increased demands on the part of the consumers. The auxiliary works at Sunbury and Hanworth were not in use during the past month. The supply of this Company is drawn from the impounding reservoirs at all times, and the intake is closed during floods.

Southwark and Vauxhall Company.—Steps have now been taken by this Company to give a constant supply on several large new estates, as follows:—Rotherhithe New Road estate, 600 yards; Goose Green estate, 1590 yards; Peckham Road estate, 1700 yards; giving a total length of main on constant supply of 3890 yards. The complete efficiency of the Company's filter-beds has been maintained during the year. Various important repairs have been carried out on the engines, boilers, and plant at the several stations; and a new sand-washing engine has been erected, to facilitate the washing of the sand for the filters at Battersea. At Hampton, new and separate steam-pipes have been fixed to the engines at the new works, a new cylinder-cover has been furnished to one of these engines, and a new piston supplied for the main pump. A new working-out main has also been fitted at this station to engine No. 2 in connection with the 36-inch main. The Company have a Bill in Parliament this session to obtain powers for the construction of subsiding and covered reservoirs, new main, and works, with a view to meet the anticipated increasing requirements of their district. A line of 12-inch main has been commenced, and is in course of being driven in the Deptford Lower Road, in anticipation of changing this district to the constant supply; as also a 9-inch main in place of the 7-inch in Grange Road, Bermondsey, with the same object. When completed, this will give about 2120 yards of constantly charged mains in addition to the other several mains so charged, and which are available for fire purposes as soon as the Metropolitan Board of Works fix the hydrants thereto. Important alterations to the 30-inch main at Kennington Church have been made, necessitated by the Metropolitan Board of Works taking into use the extra sewer.

West Middlesex Water-Works Company.—This Company are giving constant supply to a number of houses on the application of the owners, and are extending the system as required. They are also giving constant supply to all new estates and buildings, and where new services are laid down constant supply is made compulsory. The Company also commenced to give on the 1st of January constant supply, under the Metropolis Water Act, to a considerable district in St. Pancras parish. 1178 houses were put on constant supply during the past year, making the total number of houses receiving constant supply 5516. The Company have increased the depth of their filtering medium by adding a large quantity of new Harwich sand to the filter-beds at Barnes. They have also raised the inlet-pipe to the south reservoir, and fixed a splash-plate 9 feet in diameter around the stand-pipe, so that the water in falling over the bell-mouth upon this horizontal plate becomes broken up before falling into the reservoir, thereby causing aëration. A marked improvement in the quality of the water supplied by the Company is consequently now apparent. They are increasing the storeage capacity of their subsiding and unfiltered water reservoirs by taking in the whole of the spare land adjoining the present western reservoir at Barnes, and forming it into the reservoir, thus increasing the area of the western reservoir by 9 acres, making the area of this reservoir 17 acres, or a total area of all three reservoirs of 29½ acres. The reservoir capacity will thus be increased by 34¾ million gallons, making the total capacity of all the subsiding and storeage unfiltered water reservoirs 91¾ million gallons. These works are so far advanced, it is anticipated the water will be flowing into the reservoir some time this month (March).

Grand Junction Water-Works Company.—No steps have as yet been taken by this Company to give constant supply to their district. The Company have completed the construction of a storeage reservoir at their Hampton works to contain 45 million gallons of water uncontaminated by floods, and have commenced at these works the construction of three filters capable of filtering 4 million gallons of water per day, and a covered reservoir to contain 2 million gallons of filtered water. They contemplate in connection with these works the erection of pumping machinery, by which to supply a very large portion of their low-level district direct from Hampton, instead of from Kew Bridge as at present. A new line of 30-inch main has been laid from Isleworth to Notting Hill (thus completing the whole of the new line to Hampton), and is being continued to Twickenham with this object. At the Kew Bridge works, in addition to the new filter of ¾-acre, completed last year, one of the existing filters has been subdivided, and reservoirs constructed beneath to contain filtered water, and another filter has been subdivided with a view to its being similarly treated with such reservoirs for filtered water to be provided at a future time. In the neighbourhood of Grosvenor Square and Bond Street, the Company have laid duplicate mains to a considerable extent for the better supply of the high services.

Lambeth Water-Works Company.—This Company have for a long time past been giving a constant supply to their outlying districts at Esher and Molesey, and also in various courts and alleys in and about their town district; and in the October of 1878, began the systematic introduction of a constant supply, which will be continued until the whole district is brought under it. The first division thus supplied was the area from Kennington Park to the Elephant and Castle, the Walworth Road, and across Grosvenor Park and other streets to the point of commencement in the Kennington Park Road. This district contains 1880 houses, and the total number of houses on constant supply is now 7340. The Company served notices in September last on the owners and occupiers within a second division for constant supply, which came into force on the 1st of January. The locality thus to be supplied is all in the parishes of St. Mary, Newington; St. George-the-Martyr; St. Mary Magdalen, Bermondsey; and St. Giles, Camberwell, in the county of Surrey. This area contains about 7400 houses, and at Dec. 31 upwards of 1400 of them had had their fittings altered so as to be in accordance with the Board of Trade rules and regulations, while the remainder were being rapidly altered and constant service laid on. The water-pipes and fittings in all new houses are fixed in conformity with the Board of Trade regulations, so as to be ready to receive constant supply when the division of the district in which they are built is brought under it. The new filters and works at Thames Ditton, commenced in November, 1878, have now made considerable progress. These works consist of a service reservoir and four filters, each having a sand filtering surface of 1 acre; the construction of engine and boiler houses; and the erection of a pair of 90-horse power engines and pumps; also the building of boundary walls and railings. The construction of these important works will be completed towards the end of this year. When these works are completed and in operation, the total filtering surface of this Company will be about 8 acres, and they will have the power of filtering their water efficiently at all times. The boring put down at the Ditton works reached the chalk at a depth of 385 feet from the surface, and water rose to a height of 8 feet above the ground level, and continues to flow to the same height. It is estimated that from 1 to 1½ million gallons of water per day might be obtainable from this source. A boring has also, during the past year, been sunk at the Company's works at Molesey, and the chalk was reached at a depth of 426 feet. The water in this case also rises to the ground surface, but does not flow over at that level. These waters, mixed with the water from the Thames, would form an excellent auxiliary supply, and the putting down of wells at both these places is under consideration. A main, 5½ miles in length, of 18-inch, 13-inch, and 12-inch diameter cast-iron pipe, is being laid down from the Company's reservoir at Crown Hill, Upper Norwood (high-water level of reservoir, 316 feet above Ordnance datum), to Wimbledon, to improve the supply of this growing district. The laying of this main is fast drawing to completion.

Chelsea Water-Works Company.—This Company are now giving constant supply to nearly 1000 houses and factories, and are fully prepared to extend the system as required. All new estates and new lines of streets are being so supplied, though, judging by the very few applications made for such supply, there appears to be no desire on the part of public authorities or private individuals for constant service in the district. A system of auxiliary mains has been adopted by this Company. These mains, which are of large diameter (principally 24-inch and 18-inch), have been laid for the purpose of increasing the pressure, and of enabling the Company to extend constant supply as and where required. They have proved very satisfactory in every respect, and completely answer the purpose for which they were laid, as they are not only capable of conveying a larger quantity of water to the district, but have increased the pressure for high services where most required. The subsiding reservoirs at West Molesey, taken into use at the end of 1877, enable the Company to supply effectually filtered water at all times. This Company are now equal in efficiency to any of the Companies drawing their supply from the Thames, and the improvement in the quality of the water now supplied, especially during the period of floods, is of a very marked character.

Lieut.-Col. Bolton adds: From the foregoing remarks it will be seen that all the Companies are moving in the matter, and giving constant supply under the provisions of the Metropolis Water Act, 1871, in a portion of their districts, except the Grand Junction Company. The Act provides power to compel the Companies to give constant supply, as and when the public authorities may see fit to demand it; but no Company is compelled to give such constant supply if it can be shown by them that after the expiration of two months from the time of service of the requisition, more than one-fifth of the premises in such district are not provided with the proper fittings, in accordance with the regulations made under the above-mentioned Act. The number of miles of streets which contain mains constantly charged, and upon which hydrants for fire purposes could at once be fixed, in each district of the Metropolis, is as follows:—Kent, 85 miles; New River, 201; East London, 85; Southwark and Vauxhall, 115; West Middlesex, 70; Grand Junction, 35½; Lambeth, 70; Chelsea, 56; making a total length of 717½ miles. The Water Companies are ready to affix hydrants thereon when required by the authorities. The total number of hydrants erected is at present 5384, of which 2982 are for private purposes, 555 for street-watering, 1336 for public use, and 475 in Government establishments.

COMMERCIAL GAS COMPANY.

The Half-Yearly General Meeting of this Company was held on Friday last, at the Cannon Street Hotel—RICHARD BRADSHAW, Esq., presiding.

The SECRETARY (Mr. H. D. Ellis) having read the notice convening the meeting, the Chairman affixed the seal of the Company to the register of stockholders, and the minutes of the last general meeting were read.

The following report and accounts were taken as read:—

The Directors submit the accounts for the half year ended Dec. 31, 1879.

The revenue account shows a net profit for the half year of £45,820 9s. 2d. Deducting therefrom £1375 for interest on debenture stock, there remains the sum of £44,245 9s. 2d., of which, having regard to the sliding scale prescribed by the Company's Act of 1875, and the price of gas charged during the half year (reduced, as announced at the last meeting of the Proprietors, to 3s. 3d. per 1000 cubic feet), the sum of £34,600 is available for dividend.

The Directors recommend the payment thereout of dividends at the rate of £11 5s. per cent. per annum upon the old stock, and £8 5s. per cent. per annum upon the new stock, both less income-tax, and that the balance be carried to the reserve-fund.

The sum of £6200 will, in accordance with the Company's Act, be added to the insurance-fund, and invested in Government securities, and the balance of the net profits, £3445 9s. 2d., will be carried to the next half year.

To provide for the increasing demand for gas, the Directors have found it necessary to extend the Company's means of supply, and have accordingly entered into contracts for the construction of a new tank and the erection of an additional gasholder at the Poplar station. To meet the outlay thereby incurred, and to provide for the other requirements of the Company, further capital will be wanted, and resolutions will be submitted to the meeting, authorizing the Directors to raise the sum of £60,000, by the issue of new stock to that amount, payable on the 1st of July next.

The Directors have appointed Mr. H. D Ellis as Secretary in the place of Mr. E. J. Southwell, deceased, and a resolution will be submitted to the meeting as to his remuneration.

The following Directors, Thomas Morrison Fairclough, Esq., Henry Laurence Hammack, Esq., and Thomas Wrake Ratcliff, Esq., retire by rotation, and, being eligible, offer themselves for re-election.

George Ilsley, Esq., one of the Auditors, will also go out of office by rotation, and, being eligible, offers himself for re-election.

No. 1.—STATEMENT OF CAPITAL (STOCK) *on Dec.* 31, 1879.

Acts of Parliament relating to the Raising of Capital.	Dividend Authorized with Gas at an Initial Price of 3s. 9d.	Paid up.	Remaining to be Paid up and Unissued.	Total Amount Authorized.
Commercial Gas Act, 15 & 16 Vict., cap. 155	10 per cent.	£450,000	..	£450,000
Ratcliff Gas Act, 18 Vict., cap. 12	Ditto.	100,000	..	100,000
Commercial Gas Act, 38 & 39 Vict., cap. 200	7 per cent.	70,000	£210,000	280,000
		£620,000	£210,000	£830,000

No. 2.—STATEMENT OF LOAN CAPITAL *on Dec.* 31, 1879

Acts of Parliament Authorizing the Loan Capital.	Description of Loan.	Rate per Cent. of Interest.	Total Amount Borrowed.	Remaining to be Borrowed.	Total Amt. Authorized.
Ratcliff Gas Act, 18 Vict., cap 12	Mort. or Bd.	5 per cent.	..	£20,000	£20,000
Commercial Gas Act, 38 & 39 Vict., cap. 200 . .	Deben. stk.	4½ per cent.	£70,000	210,000*	280,000
* At interest not exceeding 5 per cent.			£70,000	£230,000	£300,000

Total share capital paid up (see No. 1) £620,000
Total loan capital borrowed (see No. 2) 70,000
£690,000

No. 3.—CAPITAL ACCOUNT.

Dr. Expenditure.		Cr.	Certified Receipts to June 30, 1879.	Total to Dec. 31, 1879.
To Expenditure as on June 30, 1879	£667,650 16 7	By Stock	£550,000 0 0	£550,000 0 0
Balance	22,349 3 5	New stock	70,000 0 0	70,000 0 0
		Debenture stock	70,000 0 0	70,000 0 0
	£690,000 0 0		£690,000 0 0	£690,000 0 0

No. 4.—REVENUE ACCOUNT, *for the Half Year ended Dec.* 31, 1879.

To Manufacture of gas—			**By Sale of gas—**		
Coals, including dues, carriage, unloading, and trimming (see account No. 8)	£57,285 17 1		Common gas, per meter, at 3s. 3d. per 1000 cubic feet	£106,716 18 10	
Salaries of Engineers, Superintendents, and other Officers at works	1,827 1 0		Public lighting and under contracts, common gas (See statement No. 10.)	10,386 13 11	
Wages (carbonizing)	12,789 0 0				£117,103 12 9
Purification, including £1309 0s. 9d. for labour .	3,981 13 9		Meter-rental		2,113 18 2
Repairs and maintenance of plant and works, materials, and labour (less £72 18s. 11d. received for old materials)	11,481 0 7		**Residual products—**		
		£87,364 12 5	Coke, less £1534 9s. 5d. for labour	£17,814 3 4	
Distribution of gas—			Breeze, less £77 19s. 6d. for labour	330 0 4	
Salaries and wages of Officers (including Rental Clerks)	£2,172 6 3		Tar	6,036 7 10	
Repairs, maintenance, and renewals of mains and service-pipes, including labour.	4,334 11 4		Ammoniacal liquor, less £4 4s. for labour. . .	8,411 11 10	
Repairs and renewals of meters	1,409 13 4				32,592 3 4
		7,916 10 11	**Miscellaneous receipts, viz.—**		
Public lamps—			Rents	£78 1 6	
Lighting and repairing.		1,955 12 11	Interest	61 12 3	
Rent, rates, and taxes		3,582 12 9	Transfer fees	42 12 6	
Management—					182 6 3
Directors allowance	£1,600 0 0				
Company's Auditors	75 0 0				
Salaries of Secretary, Accountant, and Clerks .	775 10 10				
Collectors commission	854 11 8				
Stationery and printing	559 6 10				
General charges	374 19 9				
		4,219 9 1			
Bad debts		737 17 10			
Law charges		80 1 8			
Superannuations		238 6 8			
Official officers		81 7 1			
		£106,171 11 4			
Balance carried to profit and loss, net revenue account (No. 5). . .		45,820 9 2			
		£151,992 0 6			£151,992 0 6

No. 5.—PROFIT AND LOSS (NET REVENUE ACCOUNT).

Interest on debenture stock	£1,375 0 0	Balance, June 30, 1879 . .	£52,744 5 0
Balance available for dividend carried to balance-sheet	63,939 14 2	Less amount available for dividend, for half year ending June 30, 1879, and paid	33,050 0 0
			£19,694 5 0
		Balance from revenue account (No. 4)	45,820 9 2
	£65,514 14 2		£65,514 14 2

No. 6.—RESERVE-FUND.

Balance on Dec. 31, 1879 .	£30,944 3 7	Balance on June 30, 1879 .	£30,461 13 7
		Dividend received. . . .	482 10 0
	£30,944 3 7		£30,944 3 7

No. 7.—INSURANCE-FUND.

Balance on Dec. 31, 1879 .	£9,347 11 1	Balance on June 30, 1879 .	£9,347 11 1
	£9,347 11 1		£9,347 11 1

No. 8.—STATEMENT OF COALS.

Description of Coal.	In Store, June 30, 1879.	Received during the Half Year.	Carbonized during the Half Year.	In Store, Dec. 31, 1879.
	Tons.	Tons.	Tons.	Tons.
Common	7,100	75,227	69,472	12,855
Cannel	1,712	4,775	5,038	1,449
	8,812	80,002	74,510	14,304

No. 9.—STATEMENT OF RESIDUAL PRODUCTS.

	In Store, June 30, 1879.	Made during the Half Year.	Used during the Half Year.	Sold during the Half Year.	In Store, Dec. 31, 1879.
Coke—Chaldrons of 36 bushels*.	1,648	95,986	30,021	62,960	4,653
Breeze do. do. .	613	8,645	..	6,738	2,520
Tar . . . . . Gallons .	173,400	651,654	..	679,454	145,600
Am. liq.—Butts of 108 galls. .	3,318	24,427	..	26,316	1,429

* Under "Weights and Measures Act, 1878."

No. 10.—STATEMENT OF GAS MADE, SOLD, &c.

Description of Gas.	Quantity Made. Meter Register.	Quantity Sold. Public Lights and under Contracts (estimated).	Quantity Sold. Private Lights (per Meter).	Quantity Sold. Total Quantity Sold.	Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lights.
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common	767,568	50,715	656,720	707,435	8,143	715,578	51,990	4,830

BALANCE-SHEET.

To Capital—				By Cash at bankers		£8,627 2 2
For balance, per account No. 3	£22,349 3 5			Ditto in hand for current expenditure		1,200 0 0
Net revenue—				Amount invested		40,291 14 8
For balance, per account No. 5	63,939 14 2			Stores in hand—		
Reserve-fund—				Coals	£11,409 0 0	
For balance, per account No. 6	30,944 3 7			Coke and breeze	1,436 0 0	
Insurance-fund—				Tar and ammoniacal liquor	1,842 7 6	
For balance, per account No. 7	9,347 11 1			Sundries	2,609 8 5	
Unclaimed dividends	1,246 2 7					17,296 15 11
Deposits	8,284 19 7			Accounts due to the Company—		
Interest on debenture stock	95 0 0			Gas-rental, quarter ending Dec. 31, 1879	£73,526 13 9	
Sundry tradesmen and others for amount due for coals, stores, and sundries	22,097 6 9			Arrears outstanding	3,936 12 9	
						77,463 6 6
				For coke and other residual products	£13,265 12 4	
				Sundries	159 9 7	
						13,425 1 11
	£158,304 1 2					£158,304 1 2

The Chairman: I will now move—"That the report and accounts, a copy of which has been forwarded to the holders of stock, be taken as read." In submitting this resolution for your approval, I think I may say that, often as your Directors have had the pleasure of meeting the Proprietors with accounts showing the growth of the Company, I believe they have never yet presented accounts which show the progress and prosperity of the Company in a more satisfactory manner than those which are before us to-day. You will, no doubt, remember that at the meeting of the Company, held in October last, I announced to you that we had been enabled to reduce the price of gas from 3s. 5d. to 3s. 3d. per 1000 feet, and that this reduction had taken place from the 1st of the previous July. Consequently the price charged the whole of the half year embraced in the accounts before us was at the reduced rate. It is gratifying to me to be enabled to point out to you that, notwithstanding this reduction in price, the gas-rental, so far from showing a diminution, as might have been expected, on the contrary shows an increase of something like £2000. The rental for the half year ending the 31st of December last having been £117,103, as against £115,064 in the corresponding half year of 1878. You will remember, of course, though I may as well repeat it, that during the December half of 1878 the price charged was 3s. 5d. per 1000, while during the corresponding half of 1879 the price was 3s. 3d., so that the larger rental was realized at the reduced price. During the same time, I may also point out to you that the residuals—the coke, breeze, tar, and ammoniacal liquor—showed a satisfactory increase over the amount realized in the corresponding period of 1878, the amount last half year having been £32,592, as against £31,707 in the corresponding period of 1878, so that on this head I think there has also been a very satisfactory increase. The total receipts have been £151,992, as against £149,379 in the corresponding period of the previous year. I think these are the salient points in the balance-sheet, as I need not refer to any of the items of the expenditure, because the total amount of the expenditure is pretty nearly the same as in the corresponding period of 1878. The result of the operations of the half year is that we have a net balance of £45,820, against £43,909 for the latter half of 1878; and during the whole of this period (I would like to mention this) we have strictly complied with all the requirements of the Legislature, as embodied in our Act of 1875; in fact, in one instance, we have greatly exceeded those requirements—I mean in the illuminating power of the gas—for I think I am correct in stating that we have uniformly supplied gas of the illuminating power of 17 candles, when we are only required to supply up to 16 candles. Well, gentlemen, as I have said, the net profit for the half year amounts to £45,820. Now, the proportion of this amount which is available for dividend is regulated by the sliding scale in the Company's Act of 1875, under which, the charge for the gas having been (during the half year ending the 31st of December last) 3s. 3d. per 1000 feet, or 6d. below the standard rate, the dividend may be increased 1½ per cent. above the standard rates, which will make the maximum dividend which could be declared on the old stock 11½ per cent., and on the new 8¾ per cent. In other words, it gives us, out of the £45,820, the sum of £34,600, which is available for dividend, and it enables us to offer you to-day for your acceptance a dividend of 11¼ per cent. on the old stock, and 8¼ per cent. upon the new stock, and leaves about £700 to be carried to the reserve-fund. This, I have no doubt, you will consider very satisfactory, and will meet with your most cordial approval. That deals with £34,000 available for dividend; but you will see that some surplus remains between that and £45,820. As to this surplus, our Act of Parliament requires that the sum of £6200 should be carried to an insurance-fund and invested in Government securities. That will be done immediately after the meeting, and the balance of £3445 will be carried forward to next account, and the amount so carried forward will go in aid of next half year's profits for the payment of dividends. The satisfactory nature of this balance-sheet is, in a great measure, no doubt the result of the increased demand for gas. This increase, so far as we can see, is steadily progressing—in fact, our experience teaches us that a reduction in the price of gas always leads to an increase in the consumption. To meet this demand for gas it is necessary to enlarge our means of supply, and we have determined to extend our works at Poplar. We have made arrangements for providing additional purifying power, for the erection of a new gasholder, and for the construction of a new tank. We have also entered into contracts for the construction of the tank and the erection of the gasholder. The amount of the contracts will be £33,000. That is the sum we require for paying for these extensions; but in order to give us some more working capital, which we very much need, we have determined to make the amount of the additional capital to be raised £60,000. We propose to obtain this £60,000 by the issue of new stock to that amount. The new stock so raised will rank equally for dividend with the present new stock, and it will be offered to all the Proprietors—the Proprietors of preference, ordinary, and new stock—in rateable proportions to their present holdings. We propose that the amount shall be paid up on the 1st of July next, and letters of allotment offering you your several proportions will be sent out in due course. Our report goes on to tell you that the Directors have appointed Mr. H. D. Ellis as Secretary, in the place of Mr. E. J. Southwell, your late Secretary, whose death I had to announce at the last meeting. The Act of Parliament—not our special Act, but the general Act regulating all joint-stock companies—requires that the remuneration of the Secretary shall be fixed by the Proprietors. It was your pleasure to fix the remuneration of the late Mr. Southwell, on his appointment, at £600 per annum, and we suggest to you that you should fix the same rate for Mr. Ellis. I do not think I need trouble you with any further remarks, and I will move—"That the report and accounts be received, adopted, and entered on the minutes."

Mr. Griffith Thomas seconded the motion, which was at once carried unanimously without discussion.

The Chairman: The next resolution is—"That pursuant to the recommendation of the Board of Directors a dividend be declared for the half year ended Dec. 31, 1879, after the several rates of £11 5s. per centum per annum upon the old stock, and of £8 5s. per centum per annum upon the new stock, in both cases less income-tax, and that warrants for the same be forwarded to the Proprietors, and that the balance be carried to the reserve-fund."

Mr. Thomas also seconded this motion, which was put, and carried unanimously.

The Chairman next moved, and Mr. Thomas seconded, a formal resolution relating to the issue of the new stock referred to in the report.

This was carried unanimously; as was also a resolution fixing the remuneration of the Secretary at £600 per annum.

The Chairman then moved the re-election of the retiring Directors, and this was adopted. The retiring Auditor was also re-elected.

Mr. Fairclough, in acknowledging the compliment paid to his colleagues and himself, said he was sure it must be a pleasure for them to do the best they could to promote the interests of the Company.

Mr. Pound said the Shareholders were, he was sure, grateful to the Board for so ably managing the affairs of the Company. They were indebted to them for having fixed the initial price of gas, and the sliding scale was satisfactory both to the ratepayers and the manufacturer. They knew that the Directors had difficulties to contend against, and it might be to a certain extent gratifying to them to know that they had the Shareholders sympathy. They hoped they would be able in the future to show results equally as good as those which they had previously placed before the Shareholders. He moved a hearty vote of thanks to the Chairman and Directors for the manner in which they had conducted the affairs of the Company.

A Shareholder expressed his pleasure at seconding the resolution which was carried unanimously.

The Chairman: It is very gratifying indeed to receive this mark of your approval—I may say this renewed mark of your approval, for we have had the pleasure of receiving similar marks of approval for many half years past. You may, I think, depend upon it, that we shall always do our best to take care of your interests. We have been most of us connected with the Company for very many years, and have stood by it, and seen it rise to its present state of prosperity. I know of no reason why we should not continue to prosper, and I hope that for many years to come we shall meet in this room. Before we separate, I should like to say that I think our thanks are due to some one else. It is customary that we should pass a vote of thanks to our Officers. You have received the accounts presented to you to-day with marks of approval, and you must know that those results are mainly due to the exertions of the Officers of the Company. It, no doubt, is an arduous task for our Engineers, on whom the new legislation we accepted in 1875 has thrown the most onerous duties. I may say that they are liable to be attacked at all points. We are under very stringent regulations as to the purity, illuminating power, and pressure of our gas, and men are placed over the district who are looking out night and day for flaws in the manufacture. It is the business of the Engineers to see that we do not infringe any of those requirements, and this is a source of great anxiety to them. It is work which knows no end—it is never done; and I think it very much to their credit, that we have been able to steer for so long without incurring any fine, and without any objection being made, or any fault-finding with us. We have not only given all we are required to give under our new Act, but have uniformly given to our consumers at least one candle more illuminating power than they are entitled to. The satisfactory state of things we exhibit to-day is, as I have said, greatly owing to the exertions of the Engineers, and I have very much pleasure in bearing my testimony to the determined way in which they have performed their work. I have also very great pleasure in bearing my testimony to the manner in which our new Secretary has discharged his duties. Our experience has shown us that we did the right thing when we appointed him, and I may say that all the Officers, from the highest to the lowest, have during the half year done their best to promote the interests of the Company. I should be sorry if we left here to-day without passing a vote of thanks to them. I move that the thanks of the meeting be given to Mr. Robert Jones, the Engineer, Mr. Henry Edward Jones, Mr. Ellis, the Secretary, and all the Officers of the Company, for the efficient manner in which they have performed their duties during the half year.

The motion having been seconded,

Mr. R. Rawlinson, C.B., in supporting it, after commenting on the difficulties of the Engineers, and eulogizing their services, took occasion to state that personally he did not think the sliding scale was a thing for them to gratify themselves too much about, as he was very much afraid they would ultimately find it was a trap. The Legislature would not allow any joint-stock company to make too much money in the shape of dividend. He would rather have preferred a steady 10 per cent. He knew of no class of company so much envied and opposed as gas companies. [A Voice: And water companies.] He did not wish to be a wet blanket, but he had given much consideration to the question, and the opinion he expressed was the result of that consideration. He would certainly take no part in inducing the other Gas Company he was connected with to avail themselves of the sliding scale.

The Chairman put the resolution, and it was carried unanimously.

Mr. Robert Jones, in reply, expressed his obligations to the Chairman for referring to the manner in which the Officers discharged their duties. The legislation of 1875 was most harassing, and kept their noses constantly to the grindstone. He did not at all agree with what Mr. Rawlinson had said as regarded the sliding scale. The Commercial Company were the first Metropolitan Gas Company who accepted those terms. It was thought at one time that they had made a mistake, but he fancied the result had shown that they had not made any mistake whatever. It was not to be forgotten that the sliding scale was a compact made between the public and the gas companies, and it was made and arranged in 1875, before, perhaps, the strongest Committee that ever sat on gas matters in the House of Commons. It had for its Chairman Mr. Forster, the member for Bradford, who thoroughly investigated the whole subject, and the Committee sat for something like 21 days, and it should also be remembered that the terms were proposed by the Metropolitan Board

of Works on behalf of the consumers. Every time the consumer had a benefit the gas company received a benefit, and he might say that it was a matter they were compelled to accept. He advised his Directors to accept it, and he was quite sure that if Mr. Rawlinson's Company had done the same thing, they would not have had that gentleman at the meeting condemning that which had been so satisfactory on both sides. This was the fifty-second half year the Shareholders had passed him a vote of confidence and thanks, and every time it had tended to encourage him, and he was sure that such a vote was always an incentive to the officers of a company.

The SECRETARY, in reply, said he felt that, at this very initial stage of his labours, the prosperity of the Company, upon which he believed the vote of thanks was based, was very little owing to anything he had done, and he would take the vote as indicating what he might expect in future if he deserved it.

The proceedings then terminated.

SHEFFIELD UNITED GAS COMPANY.

The Fiftieth Ordinary General Meeting of this Company was held on Thursday last—Mr. J. HOBSON (in the absence of Mr. F. T. Mappin, the Chairman of the Company) presiding.

The following report and accounts were presented:—

Since the last meeting nothing has occurred upon which it is needful for your Directors to make any comments in this report.

The accounts which your Board have now to submit to you show that, notwithstanding the reduction of 2d. per 1000 cubic feet which came into operation at the end of September, the profits for the half year ending the 31st of December last are only £335 10s. 0½d. short of the maximum dividend for that period, and that, after payment of such dividend, there will remain to carry forward to the credit of the half year now current the sum of £17,737 5s. 1½d.

Your Board consequently recommend that there shall be paid a dividend for the half year after the rate of 10 per cent. per annum on all the Company's paid-up capital, which will be as under, viz.:—

On £135,000 class A stock	£6,750 0 0
On £209,053 10s. class B stock	10,452 13 6
On £99,700 class C stock	4,985 0 0
On £12,937 new ordinary £10 shares (second issue), £4 per share paid up, being 4s. per share, or	2,587 8 0
On 11,462 E shares of £8 10s. each, £2 per share paid up, being 2s. per share, or	1,146 4 0
	£35,921 5 6

The maximum price of gas for the half year was, to Sept. 30, 2s. 6d., and from that date 2s. 4d. per 1000 feet.

Capital Account, for the Half Year ending Dec. 31, 1879.

Receipts.

Class A stock, fully paid up	£135,000 0 0
Do. B do. do.	209,053 10 0
Do. C do. do.	99,700 0 0
12,937 new ordinary £10 shares (second issue), £4 per share paid up	51,748 0 0
11,462 E £8 10s. shares, created May 6, 1878, £2 per share paid up	22,924 0 0
Amount raised on mortgage	18,300 0 0
	£536,725 10 0

Expenditure.

Land, buildings, parliamentary and other expenses, works, and machinery (including mains to June 30, 1855) to June 30, 1879	£404,749 6 3¼	
Less depreciation	1,924 15 0	
		£402,824 11 3½
Ditto, extensions to Dec. 31, 1879		844 2 11
Mains from June 30, 1855, to June 30, 1879	£76,438 4 9	
Less depreciation	481 3 9	
		75,957 1 0
Ditto, extensions to Dec. 31, 1879		2,379 2 11
Meters to June 30, 1879	£30,901 8 7	
Less depreciation	772 10 8	
		30,128 17 11
Ditto, extensions to Dec. 31, 1879		519 6 0
Balance		24,072 7 11½
		£536,725 10 0

Revenue Account.

Receipts.

Balance brought from last account	£18,072 15 2
Half year's gas and meter rents due this day	60,497 18 6
Amount arising from the sale of coke, tar, waste lime, and ammonia water	19,983 4 1
Amount realized from the manufacture of sulphate of ammonia, sale of gas-fittings, and work done (after deducting all charges), and house and other rents	4,401 19 11
Interest received from investments of the reserve-fund, bankers, and others	1,628 16 0
	£104,584 13 8

Expenditure.

Half year's expenditure in the production of gas	£60,560 6 6½
Paid mortgagees for interest during the half year	365 16 6
Balance	43,658 10 7½
	£104,584 13 8

General Balance.

Balance of revenue account	£43,658 10 7½	Ledger balances, and accounts owing to the Company	£59,211 9 2
Ledger balances, and accounts owing by the Company	38,674 12 2	Stores in hand	18,036 12 6
Balance of capital account	24,072 7 11½	Balance due from Bankers	29,155 15 1
		Balance due from Cashier	1 14 0
	£106,405 10 9		£106,405 10 9
Reserve-fund, invested June 30, 1879	£63,194 14 11		
Amount transferred from revenue, Oct. 9, 1879	3,860 6 1		
	£67,055 1 0		

The CHAIRMAN, in moving the adoption of the report, said the Shareholders would observe that the balance to carry forward was £17,737 5s. 1½d., against £18,072 last half year. This was a slight decrease, but they should bear in mind that there was a real reduction for the past half year, particularly for the last quarter, of 3d. per 1000 feet in the price of gas—a thing unprecedented in the business of the Company. Still, £17,000 was no small item to be carried forward on the revenue account. The reserve-fund, as the Shareholders knew, was full. The business of the Company had increased about 4·30 per cent. during the past half year, and the increased demand had caused them to use 4889 tons of coal more than in the corresponding period of 1878. The consumption of gas was still increasing, and this must be very satisfactory to all the Shareholders. The most important matter lately transacted was the letting of the contracts for coals, and he was glad to say that, notwithstanding the great prosperity in the iron trade, and the rise in the price of coke, the Company had made favourable contracts for coals for the ensuing year. This was a very important matter for the maintenance of the dividends. With regard to the works, a number of retorts were being most advantageously re-set in beds of seven, instead of five or six, and this would make it more economical for the Company in the manufacture of gas. The Company were not progressing very fast, but still they were going on steadily. A new tank and gasholder were being constructed, and the Company would thereby be able to meet the increased demand for gas that each winter produced. The Directors found that the general warehouse business of the Company in Shude Hill kept extending, and they had arranged for securing additional land which would in due time be occupied. Plans for new buildings were in contemplation, and he thought it would be of interest if the Shareholders knew that these extensions were to be made. They must not be too desirous of paying up their shares, as there was a sum of £24,072 7s. 11d. still to expend before a call could be reasonably expected. There was £18,300 yet on loan, and some of that would soon be falling due, and would have to be paid off; but he hoped the Directors would be able to meet it.

The Rev. G. SANDFORD seconded the motion, and it was unanimously adopted.

On the motion of the CHAIRMAN, seconded by Mr. T. WATERHOUSE, dividends for the half year to Dec. 31, 1879, were declared as follows:—5 per cent. on the A, B, and C stocks; 4s. per share on the new ordinary £10 shares; and 2s. per share on the E shares.

A vote of thanks was unanimously accorded to the Chairman, and the proceedings terminated.

EAST LONDON WATER-WORKS COMPANY.

The following is the report of the Directors, presented to the Proprietors at the Half-Yearly General Assembly held on Thursday last:—

The half year's accounts to Christmas last are herewith submitted to the Proprietors.

The revenue from water-rates stated therein is £1757 less than appeared in the accounts presented last year; this diminution is to be attributed to the depression of trade and the severity of the season. The progress of the Company is apparent from the increase of houses laid on, there having been 3836 additional supplies during the year 1879.

The expenditure for maintenance and repair of mains, &c., is £2355 in excess of the corresponding amount of last year, while the whole expenditure for maintenance and management is £583 less than the amount in 1878. The expenditure on capital account amounts to £30,027 19s. 11d., leaving a balance of £6028 7s. 1d. unexpended. The completion of works undertaken will exceed the amount now in hand.

The Company's works, machinery, and property are all well maintained, and in good order. The water pumped during the half year was 5,664,055,088 gallons, showing an increase of 51,753,217 gallons over the corresponding period of 1878. This increase is to be attributed in some degree to the excessive waste consequent upon the extension of constant supply, the long-continued frost involving serious damages to mains, together with the culpable action of tenants in running water continually to waste to avoid freezing during the severe weather.

Three Directors go out of office by rotation—viz., Messrs. Coope, Davis, and Barnard—but all are eligible for re-election. They have given the notice required by the Company's Act of Parliament. One of your Auditors, Mr. W. Bird, also goes out of office by rotation, but is eligible for re-election.

The Directors recommend that a dividend at the rate of 6½ per cent. per annum, clear of income-tax, on the ordinary stock be declared, payable on the 10th of July next in the usual manner.

Dr.—REVENUE ACCOUNT, FOR THE HALF YEAR ENDING DEC. 25, 1879.

Maintenance.

To Maintenance and repair of impounding and service reservoirs, works, and pipes, or for obtaining and storing of water, including the cost of materials and labour	£2,491 9 5	
Maintenance and repair of mains, pipes, fittings, meters, and works connected with the distribution of water, including the cost of materials, labour, and renewals	5,971 19 9	
Pumping and engine charges, including the cost of coals, wages, &c.	6,738 3 5	
Filtration, including the cost of materials and labour	1,895 2 5	
Salaries of Engineer and Clerks, and wages of Inspectors and Turncocks	4,801 1 10	
Rents of houses and lands, accrued due to date, and owing by the Company	768 8 6	
Abstraction of water—Thames and Lea	2,000 0 0	
Rates and taxes, exclusive of income-tax	9,780 5 9	
		£34,449 11 1

Management.

Allowance to Directors	£1,071 17 6	
Allowance to Company's Auditors	21 8 9	
Salaries of Secretary, Accountant, and Office Clerks	1,207 4 7	
Superannuation of servants of the Company	413 12 11	
Commission to Collectors	3,133 10 11	
General establishment charges	1,638 12 4	
Law and Surveyor's charges	34 2 0	
Official Auditor and Water Examiner	100 19 6	
		7,621 8 6
Re-construction of Middlesex filter-beds, subject to apportionment between revenue and capital on completion of the work		3,512 10 0
Dividend and interest account for transfer of profits		58,662 12 1
Balance carried to next account, to provide for losses		4,500 0 0
		£108,746 1 8

Cr.—REVENUE ACCOUNT.

By Balance brought from former account	£4,500 0 0		
Less sums written off as losses, viz.—Empty houses, houses cut off, and bad debts	1,986 8 5		
		£2,513 11 7	
Water-rates accrued to Dec. 25, 1879		104,200 2 1	
			£106,713 13 8
Rents of houses and lands accrued to date, and owing to the Company			1,141 18 6
Fees received for registration of shares, transfers, &c.			26 7 6
Charges for laying on water			864 2 0
			£108,746 1 8

ALLIANCE AND DUBLIN CONSUMERS GAS COMPANY.

The Half-Yearly General Meeting of this Company was held on Wednesday last—EDWARD FOTTRELL, Esq., J.P., in the chair.

The following report and accounts were presented:—

The Directors have pleasure in transmitting to the Proprietors the annexed statement of accounts and balance-sheet for the half year ended Dec. 31, 1879, duly audited.

The total revenue derived from the working of the half year amounts to £127,696 3s. 4d., the expenditure, inclusive of bond and debenture interest, &c., being £87,944 12s. 2d.; showing a net gain on the half year of £39,751 11s. 2d., from which the Directors recommend the payment of dividend at the rate of 10 per cent. per annum, free of income-tax. After the payment of dividend a balance of £10,251 11s. 2d. will remain to be added to previous balances, thus making a sum of £45,614 3s. 9d. to be carried to next account.

The Directors being satisfied that the prosperous condition of the Company warrants a further concession in the price of gas, have determined upon a reduction of 4d. per 1000 cubic feet in the city, the townships of Rathmines, Pembroke, Blackrock, and Kingstown, to take effect from the September quarter.

During the past half year the Directors have entered upon a new branch of business—viz., letting on hire gas cooking and heating apparatus. It is anticipated that a considerable increase in the sale of gas for day consumption will be effected by the introduction of this system.

The Directors regret having to record the death, during the half year, of one of their colleagues, Edward M'Cready, Esq. They have appointed to his seat at the Board

Charles Lawler, Esq., a gentleman who for many years has taken a deep interest in the Company's business.

Three Directors retire by rotation—Edward Fottrell, Esq., J.P., David Drimmie, Esq., and M. Brooks, Esq., J.P., M.P. Being eligible, they offer themselves for re-election.

The vacancy caused in the auditorship by the retirement of Charles Lawler, Esq., will be filled up at the meeting.

DR.—*Capital Account, for the Half Year ended Dec. 31, 1879.*

—	Expended this Half Year.	Total to Dec. 31, 1879.
Expenditure to June 30, 1879	..	£727,781 19 8
Expenditure on manufacturing plant, machines, storeage works, and other structures connected with manufacture (not in place of old ones)	£4,225 8 9	
New mains and service-pipes (not being in place of old ones), including laying same, paving, and other works connected with distribution	1,691 0 2	
New meters (not in place of old ones), including fixings, &c.	1,012 2 4	
Horses, carts, &c.	349 12 2	
Parliamentary expenses	682 10 2	
		7,960 13 7
Total expenditure	..	£735,742 13 3
Balance of capital account	..	1,701 16 9
		£737,444 10 0

CR.—*Capital Account.*

—	Certified Receipts to June 30, 1879.	Received during Half Year.	Total Receipts to Dec. 31, 1879.
Share capital	£589,944 10 0	—	£589,944 10 0
Bonds and debenture stock	147,500 0 0	—	147,500 0 0
	£737,444 10 0	—	£737,444 10 0

DR.—*Revenue Account.*

To Manufacture of gas—		
Coals, including dues, carriage, unloading, and all expenses of depositing same on works	£50,658 11 7	
Purifying materials, oil, water, and sundries at works	782 12 4	
Salaries of Engineers, including Chief Engineer, Superintendents, and Officers at works	1,476 0 0	
Wages at works	7,882 7 1	
Repairs and maintenance of works and plant (including renewal of retorts), machines, apparatus, tools, materials, and labour	8,555 12 0	
	£69,355 3 0	
Less old materials sold	191 14 8	
		£69,163 8 4
Distribution of gas—		
Salaries of Surveyor, Chief Inspector, Inspectors, Assistant Inspectors, and Clerks in Light Office	£1,284 3 11	
Repair, maintenance, and renewal of mains and of service-pipes, including materials, laying and paving, and labour	2,380 7 0	
Repairing, renewing, and refixing meters	1,631 12 7	
		5,296 3 6
Public lamps—		
Lighting and repairing		347 14 4
Rents, rates, and taxes—		
Rents	£795 8 5	
Rates and taxes	3,198 12 8	
		3,994 1 1
Management—		
Directors allowances	£675 0 0	
Salaries of Secretary, Accountant, and Clerks, Office-keepers, and Messengers	1,119 13 6	
Collectors commission	995 19 7	
Stationery and printing	244 17 3	
General establishment charges and incidentals	768 12 2	
Company's Auditors	30 0 0	
		3,834 2 6
Law and parliamentary charges		221 17 10
Bad debts		584 18 2
Abatements and allowances, &c.		865 10 9
Annuity account		500 0 0
Total expenditure		£84,807 16 6
Balance carried to profit and loss account		42,888 6 10
		£127,696 3 4

CR.—*Revenue Account.*

By Sale of gas—		
Gas (444,530,100 cubic feet), at 4s. 3d., 4s. 6d., and 5s. per 1000 cubic feet	£96,649 4 10	
Public lighting and under contracts	5,334 12 5	
		£101,983 17 3
Rental of meters		2,779 0 0
		£104,762 17 3
Residual products—		
Coke, less labour and cartage, &c.	£13,642 18 5	
Breeze	856 8 2	
Tar	4,217 11 0	
Ammoniacal liquor	2,522 7 2	
Spent oxide	588 3 9	
		21,827 8 6
Rents		204 0 6
Transfer fees		40 10 0
Ship *Dispatch*, money received		861 7 1
		£127,696 3 4

The CHAIRMAN, in moving the adoption of the report and accounts, said the receipts for the past half year, compared with those for the corresponding six months of the previous year, showed a diminution of £1800. This was, however, consequent upon a reduction of 3d. per 1000 feet in the price of gas, and the fact that the sum was so small showed there had been a continued increase in the use of gas. During the last half year 2000 tons more coal had been carbonized than in the same period of 1878, while an increased quantity of gas had been sent out. It was clear, therefore, that as the price of gas went down, the consumption became more extensive. The Directors, as the report stated, were encouraging the use of gas-stoves and gas-engines. There were now 32 of the latter in full operation in Dublin, and the Company had lent on hire about 50 gas-stoves or ovens, in addition to those which had been purchased. The Directors were now about to further reduce the price of gas, and in taking this step they were quite confident they could safely do it. They had extended their coal contracts, and knew exactly what their raw material would cost, and they believed it was to the interest of the Company as well as to that of the consumers that the price should be kept down whenever it could be prudently done. At the meeting of the Corporation last January some very angry expressions were uttered about the Company not reducing the price of gas. Since he had become Chairman, the rule had been followed of not answering statements made outside their general meetings. The Directors believed it was best to follow this rule, otherwise a complete reply could have been made to the statements put forth. Some members of the Corporation appeared to be glad to have the chance of making a little tirade against the Company. The Corporation were not such large consumers of gas as might be supposed. They used it at their head-quarters and at their different stations, but he did not regard the city gas-lamps as Corporation lights. The Corporation, no doubt, were the paymasters, but the 3300 lamps through the city were, in truth, separate customers, inasmuch as each had a separate service-pipe. No doubt the Corporation paid for these lamps, but when they talked of getting a liberal allowance for prompt payment, he must say that the Company were not very pressing, for the Corporation at present owed them for four quarters gas, amounting to more than £11,000. He thought, under these circumstances, the Corporation ought to be more lenient in their statements about the Company. He might add that all the talk and agitation in the Corporation last December and January did not in the slightest degree urge the Directors towards reducing the price of gas. They had made their calculations, and considered the question solely on its merits. The electric light scare came and went according as it was wanted, and the Directors felt bound to show what gas could do in the way of lighting, and do at a much less cost than that of the electric light. Accordingly, they put up a range of very fine new lamps in Sackville Street, and left them there long enough to let the Corporation judge the effect. No move, however, was made on their part towards paying for them, and, of course, the Directors, in the interests of the Shareholders, ordered the lamps to be taken down, as they could not continue supplying the gas for nothing. Naturally the citizens regretted the loss of the lamps, which formed a splendid spectacle, and effected a great improvement in Sackville Street. Since the last meeting of the Company new works had been erected at Bray, on a site secure from the encroachments of the sea, and the Company were now enabled to supply gas to that town without any interruption. In 1874 the Company took parliamentary power to raise £50,000 of capital, evidence having been given before the Select Committee that this sum was required. Since 1874, by the judicious use of the money which came into their hands—the "hanging balance"—the Directors had hitherto dispensed with raising any capital; but the time had now come when it was necessary to do so, and the Shareholders would be called to attend a special meeting at some future day to sanction the proceeding. The manner of issuing the additional capital was at present before the Board, and the Shareholders might take his word that the issue would be carried out in such a way as not to interfere with the present value of their property. In conclusion, he had to mention that the Directors would, in accordance with the notice given, submit a proposition to increase the salary of their Secretary and Manager, Mr. W. F. Cotton. Mr. Cotton had given a great deal of his time and attention to the works and business of the Company—in fact, he devoted himself day and night to their interests—and the Directors conceived that now, when they were enabled to keep up the dividend to 10 per cent., and reduce the price of gas, Mr. Cotton's services should be suitably recognized.

Mr. CREE seconded the motion, and in doing so expressed his entire approval of the efforts made by the Directors to utilize gas for other purposes than lighting. He believed there was room for very great development in this direction. He approved of the proposed reduction in the price of gas; while as to the differences with the Corporation, he saw no reason for hostility. The Corporation ought to be prepared to pay a fair price, and the Company, he was sure, were willing to charge only a fair one. With regard to Mr. Cotton, he was satisfied that no salary, within a reasonable amount, that could be paid to this gentleman would be too great compensation for the ability and untiring devotion which he displayed in the management of the Company's affairs.

Mr. S. CREAGH doubted whether it was expedient to reduce the price of gas just now. The Company did this once before, and the crisis in the coal trade which followed left the Shareholders without dividend for two years. Such a crisis might occur again, and he thought the Directors ought to pause before making any reduction.

The CHAIRMAN said before the Directors decided on reducing the price of gas they went fully into the question. They had contracts for a supply of coal for two years certain, and they felt quite safe in making the reduction. Besides, they had power to increase the price if the necessity ever arose.

The motion was put, and carried unanimously, and a dividend at the rate of 10 per cent. per annum declared.

The CHAIRMAN then moved, and Mr. CROSTHWAIT, J.P., seconded—"That the salary of Mr. W. F. Cotton, the Secretary and Manager, be increased by £250 a year."

Mr. R. BRUNKER, in supporting the motion, said he was convinced the proposed increase of Mr. Cotton's salary was simply a just reward of his invaluable services. Mr. Cotton acted in the twofold capacity of Secretary and Manager, and in the service of the Company he had manifested an ability and energy that rarely had been equalled, and certainly could not be surpassed. In 1874 the undertaking was on the verge of ruin. Mr. Cotton at that time took the affairs of the Company in hand. He undertook the duties of Secretary and Manager, and his presence was felt in every department of the concern, and now the Shareholders were receiving 10 per cent. dividend, which their Chairman gave them an assurance that day would be kept up. When Mr. Cotton began his duties they were not half so arduous as they were now. There had been a vast increase in the rental of the Company, imposing additional labour and responsibility upon him, and under these circumstances he (Mr. Brunker) repeated that the Shareholders would be merely doing Mr. Cotton justice in increasing his salary.

The motion was unanimously agreed to.

Mr. COTTON briefly returned thanks, assuring the Shareholders that they might rely upon his continued zeal and devotion to their interests.

The retiring Directors were then re-elected, and Mr. R. Brunker and Mr. G. Cree were each proposed to fill the post of Auditor to the Company. Upon a division, Mr. Cree was declared to have obtained the larger number of votes; a scrutiny was, however, demanded on behalf of Mr. Brunker.

The proceedings closed with a vote of thanks to the Chairman.

GERMAN CONTINENTAL GAS COMPANY.

We have been favoured with a copy of the twenty-fifth annual report (year ending Dec. 31, 1879) of the Directors of this Company, and the following condensed translation of the introductory description therein given of the present condition of the Company, and of the main features of their operations during the past year, will, we trust, be of interest to our readers:—

The report commences by stating that the general tenor of its introductory portion continues to be of the same character as that of its two immediate predecessors. The general depression and the decrease of gas consumption resulting therefrom were strongly marked in Germany.

Although towards the close of the year some branches of business seemed to revive, the improvement was balanced by increased slackness in other branches. The decrease of consumption in the second period of the year was therefore considerably greater than in the first period. At the German stations the decrease was 2·93, as against 0·31 per cent. the previous year. At the foreign stations the decrease was 7·91, as against 7·17 per cent. the previous year. The gross increase, which is the smallest ever recorded, was only 1·67 per cent., against 2·53 per cent. in 1878, and 3·26 per cent. in 1877. The cold weather and bright days from the middle of November almost to the end of the year had a considerable influence on the total result. There was an improvement in the Russian rate of exchange, which greatly influences the Company's profits. The average was 206, as against 205 in 1878, 210 in 1877, 256 in 1876, and 272 in 1875. In other respects the year 1879 was not very remarkable. The electric light panic has, the report states, now finally subsided. The shares of the Company having been quoted at 123 on Nov. 21, 1878, when they were at their lowest, stood at 139 on Dec. 31, 1878, and during last year gradually worked up to their usual price. On Dec. 31, 1879, they were again valued at 165. The Directors have, by the publication of pamphlets, by communications to the newspapers, and by answering innumerable inquiries, done everything in their power to assure the Shareholders, and to prevent losses to them by the Company's shares falling in value; yet they were unable to prevent large sales taking place. The shares sold have, however, in some cases been bought back at enhanced prices by the vendors. This confidence in the future of gas manufacture has by no means been caused by failure of the electric light. On the contrary, the latter is being technically developed and improved. The confidence in gas is to be attributed to a better knowledge having been gained as to the different purposes for which each method of illumination is best adapted. The electric light will never be suitable for the purposes for which gas is principally sold, on account of the mechanical and physical difficulties in the creation and conduction of electric currents. It may be hoped that the public will now become regardless of all the sensational American reports, which never cease to predict the ruin of gas lighting. The experiments made last year by the Prussian Ministry of Commerce in the use of electric lighting, at the extensive works at the port of Ruhrort, did not fulfil general expectation. The Royal Harbour Commissioners have, in consequence, recently entered into a fresh contract for gas with the Company.

Trials of the electric light have had some beneficial effect on gas lighting, more attention being now given to the production of large burners of very high illuminating power. The grand experiments made in this direction in Paris and in London fully prove that gas is suitable even for the most intense illumination, and is less expensive than electricity. Public lighting is, however, carried on so economically in Germany, that the Company scarcely expect to profit much by this class of improvements.

With respect to the competition of gas with petroleum, the report is not so favourable as in the case of that with the electric light, although the contest has not become greater. Better times are expected to bring the return of a number of consumers who have left the Company. Nothing had hitherto been expected from the duty which was imposed last year on petroleum, nor is any future benefit looked for.

The increase in the number of consumers, especially for private houses, has not ceased; yet the average yearly consumption of each burner decreased in still greater proportion than the total number of burners increased, partly because of the reduction in the number of hours worked daily, but chiefly on account of the saving of light everywhere practised. On railways the decrease thus caused was larger than anywhere else, the station-masters being interested in the economy effected thereby. The above may be said to account for the decreased consumption observable throughout Germany and Austria. In Warsaw, as in Germany after the war, business was brisk, and a large number of new establishments were erected. A considerable increase therefore took place in that city.

At present there are prospects of an extensive use of gas for cooking and heating purposes. The Company had previously endeavoured to promote this class of consumption, having considerably lowered the price of gas used for the purpose, and also for gas motors, and they are still endeavouring to develop the use of gas in this direction. Great improvements in the construction of burners, stoves, cooking apparatus, and ovens, have been made, especially in Denmark, by which it is proved beyond doubt that in the future gas will be found by far the cheapest fuel for cooking, and, under certain circumstances, for heating also. The gas-fire has the further advantage of being convenient and clean. There are towns in Denmark in which a third or half of the entire quantity of gas consumed is used for cooking purposes. The Company have engaged an Engineer especially for this branch of their business, and intend soon to send him to Denmark. It is very difficult to introduce new applications of this nature, ladies being very conservative. In spite of this, the substitution of gas for petroleum may be expected at no distant date.

The gas-meter works at Dessau were, in consequence of the depression in trade, very little employed; only 388 new indices were made and 173 repaired, and 401 were altered to the metric system, which is 170 less than last year. The manufacture of brass fittings, mentioned in last year's report, increased largely, and was further extended to simple lighting apparatus, rheometers, lanterns, &c. The net profits realized in this department were 14·18 per cent., against 7·66 per cent. last year.

In all 9496·30 marks were expended in medical assistance, insurance against personal accidents, pensions, &c. No accidents or interruptions to working occurred. The private insurance account was only called upon to bear the small charge of 232·75 marks, for covering a loss by spontaneous combustion of coal. The balance of this account is at present 96,503·02 marks.

The slackness in trade rendered unnecessary the appointment of a second Engineer to succeed the late Mr. M. Voss. Mr. O. Möhr was the sole Chief Engineer employed during the year.

It is well known to the Shareholders that the Directors have for several years had under consideration an alteration in the old lighting contracts, according to which the works would be handed over gratis to the respective communities at the end of the contract periods. On the 22nd of January a clause altering this arrangement was added to the contract with the Municipality of Ruhrort. The above stipulation is still in force only in the contracts with Mülheim-on-the-Rohr, Krakau, and Lemberg, the gas production of which is only 12 per cent. of the whole. All the other works will remain the property of the Company in perpetuity.

The consumption of gas has been classified as follows:—

	Cubic Mètres.		Per Cent.
Street lighting	2,674,368	=	14·09
Public buildings	1,777,632	=	9·37
Private houses	8,645,318	=	45·55
Manufactories and railways	5,521,965	=	29·09
Cooking, heating, and gas motors.	360,349	=	1·90
Total	18,979,632	=	100·00

For the first time the consumption for cooking and heating purposes, and for gas-engines, has been separately classified, as it may be interesting to follow the future progress in this respect, although the quantity has been partly estimated approximately, no meters being in use for some cooking apparatuses. It may be pointed out that there has been a considerable increase in the consumption of gas for street lighting, and a decrease in the consumption at railway-stations, cotton-mills, and iron and steel works. The quantity used for gas motors increased from 107,828 cubic mètres to 141,099 cubic mètres. Their number is at present 102, of about 209-horse power.

The working results of the different establishments are next examined; with the remark, that any decrease in consumption not specially accounted for is to be ascribed to depression in trade.

		Production. Cubic Mètres.	Number of Burners.
1. Frankfort-on-the-Oder	1878	1,330,430	14,969
Do. do.	1879	1,276,397	15,124
Decrease		54,033	Inc. 155

The slight increase in 1878 has thus been followed by a decrease. The profits are, however, larger, owing to more "Niederschlesische" than English coal having been used, and several economies having been introduced, especially as regards generator furnaces. Permission has been obtained for the erection of a branch establishment on the newly acquired site in Fürstenwalder Strasse.

		Production. Cubic Mètres.	Number of Burners.
2. Müllheim-on-the-Rohr	1878	867,540	11,411
Do. do.	1879	815,870	11,517
Decrease		51,670	Inc. 106

The decrease was, therefore, greater than in 1878 or 1877, which is chiefly owing to the diminished consumption at the railway-stations, in workshops and iron-works, and for the public lighting. The results were the more unsatisfactory, as the Companies were obliged, by the terms of their contract with the Municipality, to make a large reduction in the price of gas to private consumers from Jan. 1, 1879, and in the price of gas for public lighting from April 1, 1879. This alone accounts for a decrease of 11,870·26 marks. The lowest point in the consumption seems, however, to have been already passed, as the coal trade, which is of the greatest importance to Müllheim, is reviving, and there is also an improvement in the iron trade.

		Production. Cubic Mètres.	Number of Burners.
3. Potsdam-Neuendorf	1878	1,566,075	17,347
Do. do.	1879	1,545,004	17,824
Decrease		21,071	Inc. 477

Of this there was produced at Potsdam 1,313,405 cubic mètres; at Neuerdorf, 231,599 cubic mètres—total, 1,545,004 cubic mètres.

		Production. Cubic Mètres.	Number of Burners.
4. Dessau.	1878	644,725	10,650
Do.	1879	656,715	10,943
Increase		11,990	Inc. 293

This increase is attributable to the extension of public lighting and of consumption by mills.

		Production. Cubic Mètres.	Number of Burners.
5. Luckenwalde	1878	251,737	3,545
Do.	1879	272,150	3,756
Increase		20,413	Inc. 211

The increase is to be accounted for by the improvement and extension of the cloth trade.

		Production. Cubic Mètres.	Number of Burners.
6. Gladbach-Rheydt.	1878	2,645,700	30,836
Do. do.	1879	2,534,925	28,860
Decrease		110,775	Dec. 1,976

The production having considerably increased during the first half of the year, afterwards diminished during the second half, resulting in the above decrease. This is attributable to the economy practised at the railway stations and by private consumers, as well as the competition with petroleum, and the depression of several branches of the cotton industry. In the current year there is no perceptible improvement as yet. During the year 1879 the entire substitution of generator furnaces was accomplished in these large works.

		Production. Cubic Mètres.	Number of Burners.
7. Hagen-Herdecke	1878	1,033,010	11,794
Do. do.	1879	966,880	11,680
Decrease		66,130	Dec. 114

A considerable decrease, growing towards the end of the year, has, therefore, followed the small increase noted in 1878.

		Production. Cubic Mètres.	Number of Burners.
8. Warsaw-Praga	1878	6,859,991	53,147
Do. do.	1879	7,419,374	57,613
Increase		559,383	Inc. 4,466

This was the largest increase ever observed in Warsaw, the number of burners also increased more than in 1878. The recovery of enterprise and commerce following the war, and the progress of gas lighting in private houses, were chiefly the causes of this result. The rate of exchange was, however, not satisfactory, and the loss from this, therefore, remained very nearly as before. As already mentioned, the rate at which the value of the Warsaw bills had been calculated, rose from 205 in 1878 to 206 in 1879. At the commencement of the year it even fell to the lowest point reached during the war. As stated in the last report, the increased production has necessitated the erection of a third retort-house, to contain 24 settings of eight retorts to be provided with generator furnaces of the newest design. Six of these settings have already been built. This year the fourth gasholder will be telescoped, whereby the available gasholder space will be increased by about 8500 cubic mètres. It was also necessary to build another house for the *employés*, so that at least all the officers and foremen could reside on the works. Rents have risen so much in Warsaw that the building was rendered necessary for reasons of economy alone, even if it had not been otherwise required for the proper service of the works.

		Production. Cubic Mètres.	Number of Burners.
9. Erfurt	1878	1,165,941	12,671
Do.	1879	1,070,943	13,204
Decrease		94,998	Inc. 533

Although, allowing for a decrease in the loss of gas of 16,990 cubic mètres, the real consumption has fallen off 74,008 cubic mètres only, yet the decrease is not much less than in 1878. The reasons for this are the same as stated in last year's report—viz., less consumption by the railway companies, general saving by the public, and the competition of petroleum. That this last circumstance is of greater influence in Erfurt than in any other German town is accounted for, in addition to the depression, by the great and extending lamp manufacturing trade of the town. On July 1, 1879, the price of gas was reduced, whereby a loss of 6900·70 marks was sustained; but the consumption has not been thereby increased. This year, however, there appears to be a slight increase.

		Production. Cubic Mètres.		Number of Burners.
10. Krakau-Podgorze	1878	674,879	..	6,548
Do. do.	1879	663,199	..	6,607
Decrease		11,680	Inc.	59

The three previous years having been marked by an increase in the gas consumption of Krakau, there was a decrease in 1879, which appeared to grow gradually throughout the year. The state of trade is no better at this place than in Germany. The exchange slightly improved from 171¼ to 174.

		Production. Cubic Mètres.		Number of Burners.
11. Nordhausen	1878	602,164	..	8,376
Do.	1879	583,315	..	8,564
Decrease		18,849	Inc.	188

This decrease was almost entirely balanced by reduction of waste. The trade of the town has not yet recovered from the depression of 1878. No visible effect followed the reduction in price which was made on July 1, and which cost the Company 3606·97 marks. It is hoped, however, that the current year will show a better result.

		Production. Cubic Mètres.		Number of Burners.
12. Lemberg	1878	984,806	..	10,480
Do.	1879	943,107	..	11,265
Decrease		41,699	Inc.	785

At Lemberg, as at Krakau, and for the same reasons, there was a falling off instead of the usual regular increase. The exchange was the same as with Krakau. Customs were considerably increased.

		Production. Cubic Mètres.		Number of Burners.
13. Gotha	1878	605,107	..	8,457
Do.	1879	603,061	..	8,778
Decrease		2,046	Inc.	321

By diminution of waste, this decrease was converted into an actual increase of 6422 cubic mètres. The reduction of price which was made on July 1 caused a loss of 4423·79 marks, which it is hoped will be covered by increased consumption. The superfluous portion of the ground bought in 1873 for extension of works here was sold, and realized such an advanced price that the part retained did not cost anything. The building charges of the establishment were in consequence 11,325·13 marks less than the previous year.

		Production. Cubic Mètres.		Number of Burners.
14. Ruhrort	1878	461,687	..	4,327
Do.	1879	434,171	..	4,298
Decrease		27,516	Dec.	29

There was thus again a decrease here. The improvement in the iron and coal trade at the end of last year will, it is hoped, eventually extend to the business of the Company. The Ruhrort contract was similar to the other old contracts, enacting that after 30 years the town should have the right of purchasing the gas-works, and that after 50 years the works should become the sole property of the Municipality. As before mentioned, the Company succeeded in Jan. 22, 1879, in altering the contract in a manner satisfactory to both parties. Accordingly, the works are to remain in perpetuity the property of the Company, who have covenanted to gradually reduce the price of gas to 18 pfennige per cubic mètre (1·258 thaler per 1000 cubic feet Prussian), and of gas for public use to 2 pfennige per hour. The Company had also to pay 60,000 marks in cash, which amount was almost covered by the redemption-fund. The contract for lighting the harbour has already been referred to.

		Production. Cubic Mètres.		Number of Burners.
15. Eupen	1878	246,080	..	4,107
Do.	1879	275,475	..	4,002
Increase		29,395	Dec.	105

By this increase, attributable to the improvement in the cloth trade, the production nearly reached the point attained in 1874, and a further increase may be expected.

		Production. Cubic Mètres.		Number of Burners.
16. Herbesthal	1878	94,921	..	246
Do.	1879	89,168	..	246
Decrease		5,753		—

The diminished consumption by the railways was in this case, as in so many others, the reason of the decrease.

The total results of the year are as follows :—

		Production. Cubic Mètres.		Number of Burners.
1. Frankfort-on-the-Oder		1,276,397	..	15,124
2. Mülheim-on-the-Rohr		815,870	..	11,517
3. Potsdam-Neuendorf		1,545,004	..	17,824
4. Dessau		656,715	..	10,943
5. Luckenwalde		272,150	..	3,756
6. Gladbach-Rheydt		2,534,925	..	28,860
7. Hagen-Herdecke		966,880	..	11,680
8. Warsaw-Praga		7,419,374	..	57,613
9. Erfurt		1,070,943	..	13,204
10. Krakau-Podgorze		663,199	..	6,607
11. Nordhausen		583,315	..	8,564
12. Lemberg		943,107	..	11,265
13. Gotha		603,061	..	8,778
14. Ruhrort		434,171	..	4,298
15. Eupen		275,475	..	4,002
16. Herbesthal		89,168	..	246
Total.	1879	20,149,754	..	214,281
Total.	1878	20,034,793	..	208,911
Increase		114,961	Inc.	5,370
		= 0·57 p. ct.		= 2·57 p. ct.

Besides the increase in production, there is a diminution in waste to be taken into consideration, so that the real increase in consumption was 313,957 cubic mètres, or 1·67 per cent. This is not only relatively, but absolutely the smallest increase recorded in any year since the formation of the Company.

In 1878 the lost and unaccounted-for gas had been reduced as low as 5·92 per cent. During the past year it was reduced to 4·9 per cent., owing to the search for, and stoppage of leaks having been energetically continued. This is a result never before attained by any gas management, and is the more remarkable as all the street burners are provided with rheometers, which admit only the quantity of gas contracted for, thus rendering over-statements as to the street-light consumption quite impossible. The loss of gas cannot well be so small this year, as a lasting intense frost has seriously affected the pipes.

The small increase in the number of burners, four-fifths of which is due to Warsaw, is a very good indication of the bad state of things. The decrease of 2224 burners at four stations does not, however, entirely fall on the past year. A special and careful enumeration has shown that in many cases the decrease should be spread over the preceding years. In the past year, as well as in the three preceding years, the percentage of increase in the number of burners is higher than that of consumption. The average yearly consumption per burner was, therefore, again reduced. For street-lamps it was 318·8 cubic mètres, and for private burners 80·2 cubic mètres, or respectively 5·1 more and 2·1 less per cent. than in 1878. The total average was 89·6 cubic mètres, or 2·0 cubic mètres less per cent. than the previous year.

The following quantities of coal were used during last year :—

	Hectolitres.		Per Cent.
Westphalian	348,096	or	40·52
Oberschlesische	313,943	„	36·74
English	70,344	„	8·23
Moravian	69,833	„	8·17
Niederschlesische	52,321	„	6·12
Platten Kohl, &c.	50	„	0·01
Total	854,587	or	100·00

So that the proportion of "ober-" and "nieder-schlesische" coals has increased, and that of English and Moravian coal has decreased. The total increase, as against 1878, was 2003 hectolitres. The average quantity of gas made per hectolitre was 23·6 cubic mètres (1832 cubic feet English per old Prussian ton), or 0·1 cubic mètre more than in 1878.

The average price of coal delivered at the works was 1·40 marks per hectolitre, or 3d. less than in 1878. This is the lowest price at which coal has been bought for eleven years. At six stations the price was a trifle higher, at all the rest it was lower than in 1878. The greatest difference in price (22d. per hectolitre) was at Frankfort, the next was at Dessau (13d.), Krakau (11d.), and Potsdam (10d.). The considerable rise in the price of coal which took place at the end of 1879 will not affect the Company, who had previously purchased the whole of their requirements for 1880 at the same, and partly even at lower prices. Only for the small quantities of English and Niederschlesische coal were the Companies compelled to pay a slightly higher price.

The fall in the value of coke in 1878 was entirely balanced last year. The average price was 75d. per hectolitre, or 4d. more than in 1878. The rise only took place in the second period of the year, and particularly in the last month of the winter. Prospects are this year better for the coke market.

In the tar business there was a slight improvement of 9340·80 marks. The profits earned by the manufacture of salts of ammonia from the ammoniacal liquor were also very considerable, amounting to 92,572·46 marks, or 776·13 marks less than in 1878. The decrease is to be ascribed partly to an allowance having been made to the Managers, and partly to less ammoniacal liquor having been bought. Relatively there was an increase. At several stations the profits derived from the ammonia was greater than from the tar. For 1880 the prospects are still more favourable.

The greatest improvement in gas *technique*—the generator firing—caused a decrease last year also of the percentage of fuel used for the retorts—viz., from 19·79 to 19·56 kilos. of coke per 100 kilos. of coal carbonized, fuel used in getting up and letting down heats being always included. Only 36 per cent. of the total gas production came from the old settings with simple furnaces, and these are all being altered for generator firing. The change will be completed by the end of 1881. In Frankfort the generator working was most favourable, with 17·08 kilos. used for fuel, or only 27·95 per cent. of the coke made; and at Gladbach only 27·44 per cent., the Westphalian coal giving more and better coke than the Schleswig coal. In some months the consumption of fuel in Frankfort and Dessau was only 16 to 16·25 kilos.—results which have scarcely yet been equalled, and promise a further considerable decrease in the average percentage of fuel. There are also good prospects in the future of great economy in retorts, 213 being replaced last year. Detailed statistical reports of the average production of the retorts will only be possible when all the furnaces are constructed for generator firing. Although the system of generator firing, which was introduced into Germany from France, was not adopted by the Company until its technical and economical advantages had been clearly established, yet alterations had to be made and tried for several years, and many difficulties had to be removed. The system may now be considered fairly established, and the Company thank their Engineers, Officers, and Managers for their assistance in carrying this great reform into practice.

The construction accounts of the various works amount to the following sums :—

	Marks.
1. Frankfort-on-the-Oder	3,889·96
2. Mülheim-on-the-Rohr	2,035·13
3. Potsdam-Neuendorf	4,550·43
4. Dessau	2,508·88
5. Luckenwalde	1,098·32
6. Gladbach-Rheydt	73,080·69
7. Hagen-Herdecke	5,060·60
8. Warsaw-Praga	190,930·77
9. Erfurt	1,458·15
10. Krakau-Podgorze	5,104·13
11. Nordhausen	188·68
12. Lemberg	3,280·83
13. Ruhrort	1,419·10
14. Eupen	1,445·21
	296,050·88
Gotha	11,325·13
Total	284,725·75

The increase of construction capital amounted to 123,637 marks against the corresponding sum for 1878. This year extensive building operations will only be required at Warsaw; and the total cost of buildings will be but moderate.

The length of street-mains at the close of 1879 was 521,613 mètres.

During the past year the Company had fresh cause of complaint respecting taxation by the State and by local bodies. The total amount paid on this account was 113,069·04 marks, or 8455·81 marks more than in 1878. The taxation amounts to half the Company's general expenditure. Although the Galician towns are first in this respect, yet there are some in the Rhine country and in Westphalia where taxation is not much lower.

The gross profits of the works amounted to 74,169·67 marks, and a dividend of 18 per cent. was again declared, leaving a balance to be carried forward of 58,184·48 marks, which is greater than that of the previous year. In consideration of the unusually small increase in consumption this year, and the fact that the holders of the 1,500,000 marks worth of stock issued in 1878 participated for the first time in the dividend, the results must be considered highly favourable by the Proprietors.

To the premium profit on the last subscription of 123,455·77 marks must be added the premium on shares disposed of later, which was 22,284·00 marks—total, 145,739·77 marks. In accordance with the bye-laws of the Company this amount has been thus disposed of:—

	Marks.
Redemption-fund	63,618·04
Reserve-fund	75,000·00
Building	5,871·73
Costs of the allotment	1,250·00
Total	145,739·77

By the addition of the above amount, the reserve-fund has now reached 1,500,000 marks, which is the amount prescribed by the bye-laws. It is hoped that this fund will be still further increased in the future, without lowering the dividends, for the purpose of avoiding the issue of fresh loans for building purposes.

In January last the consumption of gas increased 26,951 cubic mètres. The increase would have been more favourable but for a considerable decrease at the Gladbach establishment, and the clear weather. Generally speaking, many branches of business seem to be improving, and the rise in the value of coke will be favourable in view of the cheap contracts for coal. Moreover, there is a likelihood of the exchange in Russia rising rather than falling. Prospects for 1880 are, therefore, decidedly good.

TWO MEN SUFFOCATED AT THE CHESTERFIELD GAS-WORKS.

As briefly mentioned in last week's JOURNAL, on Monday, the 22nd ult., an inquest was held at the Chesterfield Gas-Works, by Mr. C. S. B. BUSBY, the Coroner for the Hundred of Scarsdale, on the bodies of Patrick Kelly and William John Barton, labourers in the employ of the Chesterfield Water-Works and Gaslight Company. Mr. R. T. GRATTON, the Chairman of the Board of Directors of the Company, was present during the proceedings; while the examination of the witnesses was conducted by Mr. JOSEPH SHIPTON, the Solicitor to the Company.

The jury having viewed the bodies and the place where the accident occurred, formal evidence was given identifying the deceased. Barton, who was 47 years old, had been employed at the works for the last two years. Kelly was 52 years old, and had been at the Newcastle Gas-Works for 18 years, during which time he had been working at the manufacture of sulphate of ammonia, in which occupation he was employed at the time of his death.

Mr. *Charles Taylor* was then called and said: I am now Resident Engineer to the Derby Gaslight Company, with whom I have been for 15 years, previous to which I was for 10 years with the Nottingham Gas Company. I have looked at the place where the sulphate apparatus is fixed. It is the common one, and is similar to that used generally all over the country. The ventilation of the place where the apparatus is fixed seems to me to be amply sufficient, and the general arrangements are perfect.

The CORONER: Will you give us a rough account of the work in which the deceased men were employed?

Witness: The ammoniacal liquor—which is one of the bye-products of gas-making—is conducted into a boiler or still, to which heat is applied so as to promote the evolution of ammoniacal vapour. Together with carbonic acid and other gases, these fumes or vapours are conducted through a pipe or tube, and driven into a receptacle known as the saturator. This contains a solution of sulphuric acid—the "mother liquor," which promotes the formation of sulphate. The ammoniacal vapour is brought into it, and sulphuric acid added as soon as the operation commences. The tube which conducts the ammoniacal vapour terminates in a coil at the bottom of the saturator, which coil has perforations for the emission of the ammonia vapours. These then mingle with, and are retained by the sulphuric acid; and the chemical action occurs, ending in the formation of sulphate of ammonia, which is precipitated, and falls to the bottom of the vessel.

Mr. SHIPTON: Can you tell us what is the effect of putting sulphuric acid into boiling liquor?

Witness: Yes. If added in a boiling state there would be an immediate decomposition of the contents of the saturator, with an evolution of carbonic acid gas—that which in coal mines is called after or black damp; but if the acid be added when the liquor is cold, and in proper quantities, there is no danger. A sufficient volume of carbonic acid gas would have the effect of destroying life.

Mr. *Edward John Oliver*, of the Attercliffe Chemical Works, Sheffield, said: I have minutely inspected the sulphate of ammonia apparatus on these works, and consider it perfect of its kind. We are makers of the same kind of salt ourselves, and I can quite corroborate the evidence of Mr. Taylor as to the process. The effect of adding sulphuric acid to the "mother liquor" in a boiling state is that carbonic acid gas is evolved in sufficient quantities to destroy animal life. There are other gases created, in the shape of sulphides, which are of a dangerous character; but the predominant deadly gas is the carbonic acid gas. There is not the least danger in carrying out this process to a workman accustomed to it, if he exercises ordinary care.

The CORONER: What is the effect of adding sulphuric acid when the "mother liquor" is in a cold state?

Witness: It is harmless. The acid should be added before the operation commences.

Is the process Mr. Taylor described the ordinary one used for brewing sulphate of ammonia?—Yes.

Mr. SHIPTON: Can you suggest any improvements?

Witness: I know of nothing better at present. We are experimenting with an improved apparatus at our own works, but it is not yet quite perfected.

In reply to Dr. WALKER, who was called in to attend the deceased, witness said: If the process were not carried on in a proper manner, there would be a large quantity of ammonia gas in the apartment where the men were working.

By the JURY: I consider the place sufficiently ventilated. The men at work cannot interfere with a large open ventilator I saw constructed in the roof, independent of a large doorway, which is always open. In the event of an accumulation of this kind of gas, you can get it away from the vat. There is a flue erected for the purpose upon the top, so as to carry it away to the chimney or fire. Supposing the deceased had put the acid in when the "mother liquor" was cold, there would not have been an emission of gas. The vapour of ammonia would require to pass through sulphuric acid before gas could be formed.

Mr. *Charles Edwin Jones*, Resident Engineer to the Company, said: I have had 25 years experience in gas-making, and have been nearly seven years at Chesterfield. I am perfectly acquainted with the manufacture of sulphate of ammonia and sulphuric acid. The apparatus we use for the production of sulphate of ammonia is complete, and perfectly safe in its operation, with proper care on the part of the user. Patrick Kelly has been in the employ of the Company about seven months. I had an opportunity of testing his knowledge of the manufacture of sulphate of ammonia, and considered him perfectly competent to undertake it. From my own investigation and inspection of the scene and its surroundings, and according to my own judgment and examination of the men present at the accident, I am of opinion that Kelly forgot, for some reason or other, to put the sulphuric acid into the vessel at the proper time. What should have been done at half-past eight o'clock was done at a quarter to twelve in the evening, and if the liquor was by that time in a boiling state, it would be unwise and dangerous to add the acid. The fire would be lit in the ordinary course at eight in the evening, and in three hours it would have boiled. Then during the interval it would be the duty of Kelly to remove from the pans to the store the sulphate of the previous evening's manufacture. I found this had not been done. He did not empty his strainers in the ordinary course, and having neglected his work at the commencement of the evening, he endeavoured to make up for it when he found the "brewhouse" impregnated with ammonia gas, which would be, and doubtless was, passing through the "mother liquor." It appears that then Kelly, instead of getting the foreman in charge to assist him, asked a man unaccustomed to work of this kind to do so.

The CORONER: We will put it this way. If the deceased (Kelly) had gone for the foreman, it would have been the foreman's duty to have stopped the operation forthwith, and allowed the liquor to cool before adding the acid?

Witness: Yes.

Then you are of opinion that something took place when the acid was added on the evening of Saturday, shortly before twelve o'clock?—There would very probably be given off carbonic acid gas in large quantities from the mass of liquor and acid he used. The quantity of carbonic acid gas given off would be considerable, and sufficient to account for death, besides which there would be in the liquor other gases dangerous to life. I cannot account for the absence of vitriol from the saturator on any other hypothesis than that of forgetfulness. Kelly was a very good servant, and understood his work, but on this occasion he evidently did not exercise sufficient or reasonable care. His duties were mechanical, and he was quite competent to perform them, and I cannot account for the absence of vitriol from the "saturator," except by forgetfulness on his part.

By the JURY: The hotter the "mother liquor" the more gas would be produced. The operation of making sulphate of ammonia consists of neutralizing or saturating sulphuric acid with ammonia gas, which produces a salt called sulphate of ammonia. In the apparatus we use there are two divisions, one only being used for saturating, and when the liquor is prepared for the ammonia coming over from the boiler it is acid. After the brewing, the residue is transferred to the other division, that is what is called the "mother liquor," and it is used over again. The salt which falls to the bottom of the "saturator" is sulphate of ammonia, which is then removed with an iron shovel, and put into the strainers to dry.

A JURYMAN asked: Would it not be better to employ something else than men to put the acid in?

Witness: There is a feed-tank attached to the saturator, but the men do not seem to have used it. It is placed a little higher than the saturator, and they have to lift the acid about 3 ft. 6 in. to put it in. On this evening they put it in the easiest way.

The CORONER: You say they did not, it appears, use the feeding-tank erected for supplying sulphuric acid, but instead they poured the contents of the carboys over the side of the saturator?

Witness: Yes; exactly so.

John Higginbottom, engine-tenter and foreman of stokers at the works, said he had been in the employ of the Company for 35 years next Whitsuntide. He was in charge of the works on the Saturday night the accident happened. The manufacture of sulphate of ammonia had been carried on at the works in the same way as at present for the last 30 years at least, and during that time he had not heard of a single accident happening. He saw Kelly in the yard on the Saturday night. He first came in about a quarter to six, and at eight o'clock he took a shovelful of fire to light his fire in the "brewhouse." Witness saw him again a little before ten, and at half-past eleven in the stoker's lobby, and he went from that place to the sulphate house. Soon after he had left, witness heard some one crying for help; but being Saturday night, and a great many people passing, he thought at first it was in the lane. The timekeeper afterwards fetched him to the brewhouse, and he went in, but could not stay there on account of the smell. He saw the liquor in the saturator. It was boiling, and foam was on the top of it. Three carboys of acid should have been used that evening; but he found only two empty ones, the other full. Kelly should have put the acid in at eight o'clock—as soon as he lit the fire. He was in the habit of putting it in at that hour. In regard to the sulphate in the strainers, when it was made into "salt" it was his duty to get it out, but this was not done. Supposing Kelly wanted some assistance, he should have come to witness, but he did not. The effect of putting acid into the hot liquor would be to cause a foam to come on the top of the liquor, and gas would rise which would be strong enough to knock any one down. If Kelly had come to witness, he should not have allowed the acid to have been put in. The other deceased, Barton, was employed regularly on the works as a stoker, and had no business to go into the "brewhouse."

William Hawley, timekeeper at the works, said that about half-past ten o'clock on the night of the accident he saw Kelly in the stoker's room having his supper. He again saw him about 25 minutes to 12, going in the direction of the sulphate house. A few minutes after, on entering the sulphate house, he saw Barton lying on his face, all his length, and Kelly sitting down with his head leaning on the side of the vat. All the sliding doors were open. He tried to examine the deceased; but there was ammonia gas about, which prevented his staying to see who they were. He went to the doors and called for help, and then went inside, took hold of Barton, and tried to carry him out, but could only get him near the doorway, when, being overpowered, he had to drop him. When he dropped, witness fell over his body, on his face, with his head outside the door. He did not know how long he was there, but he was sensible, and cried for help, though he could not move his limbs. When he did regain the use of his limbs, he got up and fetched two stokers named Ellis and Higginbottom. He returned, and Ellis and he went in together. They got hold of Barton, and brought him out. Higginbottom then ran inside to fetch Kelly, and almost directly afterwards came reeling out, and fell

down in the yard. Ellis and witness afterwards went in again, found Kelly against the vat, pulled him outside, and tore his clothes open and felt whether his heart was beating, but could detect no pulsation whatever.

Mr. SHIPTON: Did you notice in what state the liquor was in the saturator?

Witness said he could hear it boiling violently. There were two empty carboys and one full, or partly full of acid. The full one was at the side of the men. Not near the empty ones. They were near the door.

By the JURY: The deceased men were quite sober when witness saw them, and had not been out for beer.

Mr. JONES said he would now call a man to prove that Kelly was warned of the danger of the work, and that he had full instructions with regard to putting in the acid.

Walter Bates, a lamplighter in the service of the Company, said he was at one time employed in making sulphate of ammonia at the works, and was doing so when Kelly came. He showed deceased the work, and gave him instructions as to how to proceed. He told him first to fill the boiler, and to see that his taps were open. Then make a fire under the boiler and put the lime in. Next to open the tap belonging to the steam-pipe, and put his acid in, and he said, "Well, I can go forward with it." He said he had been used to lighting the fire, and witness told him he must put the acid in before he had any heat up at all. Also that if he did not have it in before the steam was up, it would knock him down, and he would not be able to get out. He replied that he had been used to that kind of work, and it would not hurt him; he would see to it.

By the JURY: Witness thought the apparatus was perfect if the acid was put in at the proper time.

Dr. *William Abraham Walker* said: I was called at midnight on Saturday, March 20, to the gas-works, and found the two men, Barton and Kelly, in a side room in the works yard, where they had been removed after having been found. I examined Kelly carefully, and found him to be quite dead. There was some sign of life in Barton, and by the aid of artificial respiration and other attentions, his breathing became fairly re-established; but tetanic spasms and convulsions supervened, and he sank in twelve hours after being found. I consider that he died from poisoning by ammonia gas.

The CORONER: Not carbonic acid gas?

Witness: No. The smell of ammonia was in the breath, and the symptoms were those of poisoning by ammonia.

Can you form any opinion as to Kelly's death?—I consider he died from suffocation, probably by carbonic acid gas.

The CORONER, in summing up the evidence to the jury, said: The material point to be considered is that Kelly, knowing his duties, part of which, we have been told, was at eight o'clock each night to pour sulphuric acid into the vat, it appears that from some reason or other he did not do so until twelve o'clock; at all events, when he put the two carboys full of sulphuric acid into the vat it was boiling. We also learn that he neglected some other of his duties, part of which was to carry away the sulphate which had been made the previous night or day. He was about the place from the time he came on until the accident happened. The other man, Barton, went with him, and when they had been in the "brew-house" a few minutes this accident took place. Shouts were heard, and some one, on going to the house, immediately found the two deceased, who were suffering from the effects of the gas they had inhaled. Two of the carboys of acid were found empty, and one full, and the suggestion is, that having poured in the two carboys full when the liquor was boiling, they were affected, and had not strength to pour in the third. This seems to be the whole state of affairs. Kelly neglected his duty. He ought to have put the acid in when he lighted the fire, and in consequence of his neglect this accident has happened, and he has, unfortunately, died through his own neglect. Really, the work in which he was engaged was, with care, not dangerous. He had been employed in a like occupation for many years, and was warned of its nature on entering the employ of the Company. It does not appear that he was incompetent for his work, but rather, it seems to me, his death was caused by his own neglect, that no one was culpable, and that he suffered from want of caution in his office. As to Barton, he had no right at all in the place where he was found, and was ignorant of the danger he ran in being there. The death of these two men were, I consider, caused by an accident, but sufficient caution was not, it seems, exercised by Kelly.

The jury, having considered the evidence and the summing up, returned a verdict "That the accident happened through deceased's own neglect," and exonerated all the officials of the Company from any blame whatever.

BURNLEY CORPORATION WATER SUPPLY.

THE PROPOSED EXTENSION OF THE WATER-WORKS.

It may be remembered that at the meeting of the Burnley Town Council on the 3rd of December last [see JOURNAL, Vol. XXXIV., p. 939] the minutes of the Water Committee contained a recommendation for extending the Corporation water-works in Swinden Valley, and connecting them with those in Thurston Valley, at an estimated cost of not exceeding £80,000. The details of the proposed extension were explained by the Chairman of the Water Committee (Mr. Keighley), and after a short discussion the recommendation was agreed to, the General Purposes Committee being instructed to apply to the Local Government Board for their sanction to the Corporation raising the necessary funds for carrying out the proposed works.

Application having been forwarded to the Board for permission to borrow £74,000 for the above purpose, Mr. C. NEALE DALTON, one of their Inspectors, held an inquiry into the subject at Burnley, on Tuesday, the 23rd ult.

The TOWN CLERK (Mr. A. B. Creeke), in support of the application, stated that the water-works had belonged to the town since 1846, under three Acts of Parliament—those of 1846, 1854, and 1871. By the last-named Act they had power to extend the works, and with this object to borrow and expend the sum of not exceeding £30,000. They had already borrowed and laid out £24,000, leaving £6000 unexpended, which, taken from the estimated cost of the proposed works (£80,000), left the sum applied for—£74,000. As showing the rate at which the town had increased, he mentioned that 750 new houses were built in 1878, 400 in 1879, and about 150 this year; but the Inspector would remember that the two years just referred to were very indifferent ones, on account of the depression in trade. Now, however, there were signs of greatly increased activity, inasmuch as already 150 new houses were in course of erection. The supply of water was sufficient at present, by the exercise of great economy, and with a fair quantity of wet weather; but in the event of a long-continued dry season the supply would be very inadequate. Already notices had been given prohibiting the use of water for cleaning windows and washing flagstones. It would take eight or ten years to complete the proposed works, and it would be three or four years from the time of commencing the works before there could be any increase whatever in the supply.

Mr. *J. Hitchon*, Surveyor to the Corporation, having put in the plans he had prepared,

Mr. *J. Emmett*, the Manager of the water-works, explained the details of the scheme. He estimated the cost would be covered by an outlay of £71,089, and this included 10 per cent. for contingencies. The Committee had, however, asked for more than this, as they thought the work could not be done for the money. Difficulties certainly might arise which would render necessary the expenditure of the £80,000 set down in the application. He thought, supposing the increase of new buildings went on as before, £200 or £300 a year would cover the cost of extension of the water-mains, and, so far as he was aware, nothing else would have to be paid out of capital during the next few years. There were now in use 1090 acres in the Swinden Valley and 1000 in the Thurston Valley, to which the extension was being made. There were, on the 30th of June last, 12,098 houses, and taking the average population to be 5¼ per house, it would be 63,515, though it must be borne in mind that the Corporation supplied with water others besides those in the borough. At present they only had, in dry weather, a supply of 789,891 gallons per day. When the work was completed there would be an ample supply, for the amount of water flowing into the town would be doubled, although the gathering-ground would not be increased by one-half. This was explained by the fact that there would be no extra compensation to give.

Mr. *J. Green*, C.E., of Portsmouth, stated that he had inspected the plans, ground, and details of the proposed extension, and considered that it was not only a good one, but that it was the only one which could be relied upon at the present time. The estimate presented by Mr. Emmett was also a fair one, though the item for contingencies might not prove sufficient, and he thought it would be prudent to ask for £80,000. At the same time, however, he did not anticipate that the estimate made by Mr. Emmett, of £71,000, would be exceeded.

The INSPECTOR intimated that he had all the information he required, and the inquiry terminated.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Trade in this district has not yet settled down to its usual course, the excitement consequent upon the elections being a disturbing element which interferes very considerably with business. Very little, therefore, has been transacted during the past week, and in what has been doing the tendency of the market has generally been towards weakness, with the exception that engine fuel is firmer. This, as I pointed out in previous reports, is the natural result of the diminished production of slack, and colliery proprietors who have very little of this description of fuel to offer are in most cases asking an advance of about 5d. per ton upon last month's rates. With regard to all classes of round coal, however, prices are very weak and irregular, and where sales are pressed low figures have to be taken. The average quoted prices at the pit mouth may be given about as under:—Best Lancashire round coal, such as Arley Mine coal, 8s. to 8s. 6d.; second qualities, such as inferior Arley and Pemberton four-feet, 6s. to 6s. 6d.; common Lancashire round coal, 5s. to 5s. 6d.; burgy, 4s. to 4s. 6d.; good slack, 3s. 6d. to 4s.; and common, 2s. 9d. to 3s. 3d. per ton.

For good cokes there is a steady demand, and some makers have advanced their prices 5d. per ton.

In the iron trade the tendency of the market is also towards more weakness, and local makers of pig iron are not holding so firmly for their full list rates as they were. They are, however, still so much undersold by iron in second hands that they are securing very few new orders, and the iron at present going away is almost entirely on account of old orders. Nominally, the quotations for Lancashire pig iron delivered into the Manchester district remain at about 70s. per ton, less 2½ per cent. Second-hand lots of bar iron can still be bought at about £8 per ton delivered into the Manchester district, but very few of the makers as yet are quoting under £8 10s. to £9 per ton.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

Commercial men have been very much taken up with electioneering. There has been great excitement in Northumberland and Durham, as every division of the counties and all the boroughs except Morpeth have been or will be contested. Durham county is being fought out by representative men connected with the coal trade. Colonel Joicey is a partner in extensive gas collieries. Sir George Elliot has also a large capital embarked in pits, the Hon. Mr. Lambton is brother to the Earl of Durham, who has extensive possessions in collieries, and Mr. J. W. Pease is by far the largest holder of colliery property in South Durham. Under these circumstances the energies of most persons concerned in the coal trade in the county of Durham are absorbed in politics, and a very small measure of attention is given to trade.

As the days extend, the demand for gas coals, as is usual at this season of the year, begins to weaken. The steam coal trade of Northumberland is in what may be described as a small crisis. Merchants made contracts with owners for the delivery in April of best steam coals at 10s. per ton; but now the time for delivery has arrived they cannot find a market at the advanced price. Merchants upon the Continent continue to hang back, and there is just a possibility that the buyers for forward delivery may "make" a considerable loss by the speculation. Nothing is doing in steam except at the old rates, and it is very likely that affairs may hang on in this condition for a week or ten days, when the buyer or the seller will have to yield to the circumstances of the hour. They seem rather to favour the notion that the buyers will, to some extent at least, remain masters of the situation. Household coals continue in a depressed state. The market for manufacturing coals and coke is unchanged from last week.

More business has been transacted in chartering vessels for the Baltic, but trade to that sea is hardly up to the April form. The supply of tonnage is pretty abundant, not only for the Baltic, but for all parts of the world. The coasting trade continues quiet. What there is doing is with craft of from eight to ten keels. The figure offering for vessels of this description is from 6s. 9d. to 7s. for the bye-ports.

Steamers are taking coals to London at 4s. per ton; Hamburg, 5s.; Copenhagen and Swinemunde, 6s., which are low quotations.

The somewhat large shipments of fire-bricks to the Continent continue. They are being sent out to the North of France, Holland, Germany, Denmark, and Spain. The quotation for small vessels to load fire-bricks for London above the bridges is 8s. per ton, but only a special sort of craft can take up orders of that description. The iron trade of the Cleveland district is quiet, if not a little dull; but very little new can be said about business until the elections are through.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The arrangements for the next half-yearly meeting of the West of Scotland Association of Gas Managers, which is to be held at Hamilton on the last Thursday in the present month, are in a forward state. Besides the presidential address of Mr. Mitchell, Coatbridge, there will be papers

treating of the construction of gasholders, the valuation or rating of gas-works, scrubbers and scrubbing, and on Painter's hydrostatic joint for gas and water mains. I understand that Mr. Levi Monk is to describe some peculiar arrangement which he has in operation at the Lanark Gas-Works, in which there are embodied some of the principles of the Aitken-Young system of condensation and Young's system of scrubbing. Amongst the other authors of papers to be read, I may mention Mr. Brodie, Gas Engineer, of Paisley, and Mr. Niven, of the Dunoon Gas-Works.

There was a large gathering of people more or less interested in gas affairs at the Partick station of the Glasgow Corporation Gas-Works last Friday, the occasion being the public auction of the plant connected with the station, as it has been found desirable to depend upon the Dawsholm station for supplying the district which for the better part of 40 years has obtained its supply of gas from the Partick works. Amongst the persons present there were the gas managers from Greenock, Dumbarton, Maryhill, Coatbridge, Milngavie, Grangemouth; Messrs. William Young (Clippens Oil-Works), Robert Laidlaw, D. M. Nelson; James Donald (Hanna, Donald, and Wilson, of Paisley); Provost Kennedy, contractor, Partick; Mr. W. Foulis, Mr. Granger, and others. There were three gasholders sold, one of which measures 100 feet in diameter, rises 40 feet in two lifts, and has a capacity of 350,000 cubic feet. The smallest of the three is 40 feet in diameter, rises 20 feet, and is capable of holding 26,000 cubic feet. When it was put up in the year 1842 by Mr. J. B. Neilson, the inventor of the hot-blast, it was considered to be the largest gasholder in Scotland. It consists chiefly of plates having a thickness equal to No. 16 Birmingham wire gauge. In all, there were 142 lots, for some of which there was rather brisk competition. It is understood that a good deal of the plant was purchased for the Glasgow Corporation Gas Commissioners. Mr. Archibald H. M'Culloch (Morrison, Dick, and M'Culloch, of Glasgow) was the Auctioneer on the occasion. There is some talk of the Partick Burgh Commissioners tendering for the purchase of the large expanse of ground which the works and adjoining properties at present occupy. The site is almost in the centre of a large suburban town, and when cleared and opened up it will be well suited for use as an open recreation space, and partly for new streets of dwelling-houses, shops, &c.

The subject of casting gas-pipes vertically in 12-feet lengths bids fair to become one of considerable importance in the estimation alike of pipe-founders, gas managers, gas companies, &c. It seems that vertically-cast pipes of that length down to 4 inches in diameter are extensively produced in the United States, whereas in Glasgow, which is the largest seat of the pipe-founding industry in the world, it is seldom that such pipes are made of less than 15 inches in diameter. Two or three Glasgow firms are said to have tried to produce pipes of the kind referred to down to 8 inches in diameter; but owing to the great difficulties connected with their foundry plant, the waste, the trouble with the workmen, &c., the results have been anything but satisfactory, and the attempts to meet the inquiries and demands had to be departed from. On that account a number of orders have been put past the Scotch founders, one of them a Canadian order, quite lately, which was eventually placed in the United States. It is urged that Scotch pipe-founders ought not to stick at a trifle in order to meet successfully this new element in competition, and that they should not hesitate to spend some effort in learning what improvements have been made in pipe-founding in America, so that 12-feet lengths of piping have become a regular article of trade. Doubtless gas managers would welcome the advent of such pipes in this country, as their use would effect a great amount of economy in jointing, and therefore a large saving in the leakage which has so widely and so frequently to be deplored.

Notwithstanding the extraordinary degree to which the public mind is absorbed with the elections which are now in progress, the leading Scotch newspaper has found space within the past few days to devote to an interesting and comprehensive article on "Gas-Engines," a subject which is exciting a large amount of attention in Scotland. The article makes special reference to the gas-engines which have been put up at the extensive new works at Parkside, Edinburgh, belonging to the eminent printing and publishing firm of Messrs. Thomas Nelson and Sons, one of them being about the most powerful of the kind yet constructed. I believe it is nominally an engine of 16-horse power.

On Friday, the 26th ult., the Shareholders of the Denny Gas Consumers Company, Limited, held their annual business meeting—Mr. John Cousland, merchant, Chairman of the Company, presiding. The Directors submitted their report, which announced that the works of the Company were in a satisfactory state of efficiency and order. The financial statement and balance showed that the Directors had been able to conduct the affairs of the Company with profit; and they recommended that, besides the 6 per cent. interest which fell to be paid on £1000 of preference shares, a dividend of 10 per cent. be declared on the ordinary shares of the Company. The Directors had to acknowledge the care and attention bestowed on the affairs of the Company by the Working Committee, and by Mr. John Potter Scott, the Manager, on whom so much depended for the successful and profitable carrying on of the works. The report was unanimously adopted, and a dividend of 10 per cent. on the ordinary shares was agreed to, as recommended. Messrs. Shanks, Cousland, Bulloch, and Campbell, the retiring Directors, were re-elected; and Mr. J. Cousland was re-appointed Chairman of the Company.

When speaking of the Prestonpans Gaslight Company, a couple of weeks ago, I omitted to mention that the Directors had resolved to reduce the price of their gas to 5s. 10d. per 1000 cubic feet over all their services.

Last week's Glasgow warrant market was very steady, and the amount of business done was much curtailed. The bulk of the buying was done to cover "bear" sales made at the higher prices. Iron for forward delivery is in very limited request, and shipping iron is exceedingly flat; indeed, the demand has almost disappeared. Makers have reduced their quotations, but all brands are pressed for sale at much below the official list prices. Large parcels bought on American account are being re-sold in Glasgow instead of being shipped. As low as 54s. 9d. cash was accepted on Friday forenoon, but at the close in the afternoon 55s. 3d. was the price for sellers, and buyers offered 1½d. per ton less.

The coal market remains quiet, with no new feature, and prices rule low.

Carleton Water-Works Company, Limited.—A Company under this title was registered on the 22nd ult., with a capital of £2000, in 1000 shares of £2 each, the object being to supply the village of Carleton, near Shipton, with water.

Briton Ferry Local Board Gas Supply.—The monthly meeting of the Briton Ferry Local Board was held on Thursday last, when the Gas Manager (Mr. W. Cheyne) reported that the coal he had been using during the past month produced an average of 10,870 feet of gas per ton. Also that the sales of gas for the quarter ending March 31 exceeded those of the corresponding quarter of last year by about £30, notwithstanding the reduction recently made in the price of gas; and that the accounted-for gas for the half year was over 9550 cubic feet per ton of coal carbonized. In answer to a question from a member of the Board, the Chairman stated that the unaccounted-for gas was 8½ per cent., which was very good, and for which Mr. Cheyne deserved great credit, seeing that it was 33½ per cent. when he took charge of the works.

Technological Examinations.—The arrangements for the technological examinations of the City and Guilds Institute are now complete, and notice has been issued to all secretaries of science classes throughout Great Britain and Ireland of the system to be adopted. These examinations, as has been already mentioned in the Journal, are worked concurrently with, and on the same system as those of the Science and Art Department. They will be held on the 12th of May, on which day also part of the science examination is held. By thus availing itself of the existing organization of the Government, the City Institute is enabled to hold its examinations all over the kingdom, as there are now no places of importance at or near which there is not a centre for the Government system. There are 32 subjects of examination, covering all the chief industries of the country—all, at least, in which the application of science is such as to enable theoretical knowledge to be tested by examination. Any workman, or any person connected with any manufacture included in the scheme, wishing to obtain a certificate testifying to his knowledge of that manufacture, has merely to apply to any one of the numerous Local Secretaries of the Science and Art Department, and ask him to return his name, as a candidate, to the office of the Institute, at Gresham College. When the day for examination arrives, the candidate will have to present himself at the centre where he has sent in his name, and he will find a paper of questions ready for him. If he succeeds in answering these, he will in due course receive a certificate. There are now over 50 classes in different parts of the kingdom, in which students are being prepared for these examinations, but the examinations are also open to any person who likes to try for a certificate or for one of the prizes to be given by the Institute. Further information can be obtained on application at the Halls of the Companies of Mercers, Drapers, and Clothworkers, London.

Share List of Gas and Water Companies.

Number of Shares issued.	Amount per Share.	Name.	Amount paid up per Share.	Last Divd. p.Cent. p. Ann.	Latest Quotations.
	£	Gas Companies.	£ s. d	£ s. d	£
589892	10	Alliance and Dublin	10 0 0	10 0 0	15½–16
10000	20	Anglo-Romano . .	20 0 0	10 0 0	21–23
5000	20	Bahia (Limited). .	20 0 0	4 0 0	14–15
1500	20	Do., 2nd pref. . .	20 0 0	7 10 0	20–22
40000	5	Bombay (Limited).	5 0 0	7 10 0	5⅞–6¼
10000	5	Do., fourth issue.	4 0 0	7 0 0	¼–⅜ pm.
10000	10	Bournemouth . . .	10 0 0	8 0 0	13½–14½
229700	..	Brentford	100 0 0	9 0 0	144–148
..	..	Do., 5 per ct. pref.	100 0 0	5 0 0	95–100
..	20	Do., C shares . .	18 0 0	9 0 0	6–8 pm.
5400	20	Brighton	20 0 0	10 0 0	33–35
5000	20	Brighton and Hove	20 0 0	10 0 0	33–35
14000	20	British (Limited) .	20 0 0	10 0 0	34–35
7223	20	Cagliari (Limited).	20 0 0	6 10 0	16½–17½
1500	10	Colney Hatch . . .	10 0 0	5 0 0	9–11
5500000	8k.	Commercial	100 0 0	11 0 0	188–193
70000	8k.	Do., 7 per cent. .	100 0 0	8 0 0	135–140
20000	20	Continental Union.	20 0 0	6 10 0	19½–20½
20000	20	Do., new	14 0 0	6 10 0	1½–⅝ dis
10000	20	Do., preference .	20 0 0	7 0 0	23½–24½
750000	8k.	Crystal Palace District	100 0 0	10 0 0	172–177
125000	8k.	Do., 7 per cent. .	100 0 0	7 0 0	122–127
50000	8k.	Do., preference .	100 0 0	6 0 0	118–122
25000	6	Do., ordinary 7 per cent. . . .	1 4 0	7 0 0	¾–1 pm.
7100	25	Edinburgh	25 0 0	10 0 0	46–48
23406	10	European (Limited)	10 0 0	10 10 0	18½–19½
12000	10	Do., new shares.	7 10 0	10 10 0	5–6
35406	10	Do., new shares .	5 0 0	10 10 0	3½–4½
4096300	8k.	Gaslight & Coke A.	100 0 0	10 10 0	177–179
100000	8k.	Do. B.	100 0 0	4 0 0	73–75
50000	10	Do. do., 5th do. .	10 0 0	5 0 0	16–17
200000	8k.	Do. C 10 p.c. pref.	100 0 0	10 0 0	205–210
300000	,,	Do. D do. do. .	100 0 0	10 0 0	205–210
165000	,,	Do. E do. do. .	100 0 0	10 0 0	205–210
30000	,,	Do. F 5 do. do. .	100 0 0	5 0 0	101–104
60000	,,	Do. G 7½ do. do. .	100 0 0	7 10 0	150–156
1300000	,,	Do. H	100 0 0	7 0 0	128–132
..	..	Georgetown, Guiana	5 0 0	7 0 0	4¼–4¾
300000	100	Glasgow Corporation Gas	100 0 0	9 0 0	205–210
115000	100	Do., do.	100 0 0	6 15 0	155–160
..	100	Grimsby Gas, A. .	100 0 0	..	186–190
10	10	Hampton Court . .	10 0 0	10 0 0	15–16
7000	10	Hong Kong (Lim.)	10 0 0	10 0 0	15–16
5000	10	Hornsey	10 0 0	10 0 0	15–16
100	100	Imperl. Continental	100 0 0	10p.c.& 2 p.c.	182–184 bonus
..	..	Kingston	..	..	..
..	..	Lea Bridge	..	7 0 0	11½–12½
561007.	100	Liverpool United .	100 0 0	10 0 0	180–185
169100	100	Do., B	100 0 0	7 0 0	125–135
386500	8k.	London	100 0 0	10 0 0	175–180
150000	8k.	Do., 1st pref. . .	100 0 0	6 0 0	123–126
7622	25	Do., A shares . .	25 0 0	6 0 0	29–31
26692	8k.	Do., Debent. stk.	100 0 0	5l. & 6l.	..
15000	5	Malta and Mediterranean (Limited).	5 0 0	2 10 0	2–2½
6000	5	Do., preference .	5 0 0	7 10 0	5–5½
20000	5	Mauritius (Limited)	2 5 0	1 0 0	1⅞–1¼ dis
25000	20	Monte Video (Lim.)	20 0 0	6 0 0	13–14
8000	10	Nietheroy, Brazil (Limited)	10 0 0	5 0 0	3½–4½
30000	5	Oriental (Calcutta).	5 0 0	9 0 0	7–7½
30000	5	Do., new shares .	3 10 0	9 0 0	1¼–1¾pm.
10000	5	Ottoman (Limited).	5 0 0	3 0 0	2–2½
10000	10	Pará (Limited) . .	10 0 0	4 10 0	5⅞–6¼
27000	20	Phœnix	20 0 0	10 0 0	35–37
360000	100	Do., new max. 7½	90 0 0	7 10 0	115–20
144000	8k.	Do., capitalized .	100 0 0	5 0 0	87–92
..	20	Do., new, 1876. .	16 0 0	10 0 0	15–17pm
$7500	20	Rio de Janeiro (Limited)	20 0 0	10 0 0	25–27
1500	32½	Shanghai	32 10 0	12 0 0	.. [pm
135000	100	Sheffield, A	100 0 0	10 0 0	197–198
99700	100	Do., C	100 0 0	10 0 0	195–197
12500	5	Singapore (Lim.) .	5 0 0	7 10 0	5¾–6
2000	5	Do., preference.	5 0 0	7 10 0	5¾–6¼
500000	8k.	South Metropoltn.	100 0 0	11 10 0	200–205
..	..	Do., "B" . . .	100 0 0	10 0 0	180–185
..	5	Tottenham & Edmonton	5 0 0	10 0 0	8¼–8¾
1500	10	Wandsw. & Putney	10 0 0	10 0 0	14¾–15
1500	10	Do.	10 0 0	7 10 0	12¾–13¼
4000	10	Do.	10 0 0	7 0 0	11¾–12
26000	5	West Ham	5 0 0	10 0 0	8½–9¼
..	10	West Kent	10 0 0	10 0 0	14–16
2400	5	Woolwich, Plmstd. and Charlton . .	5 0 0	16 0 0	9–10
		Water Companies.			
615600	100	Chelsea	100 0 0	6 10 0	197–202
1624700	100	East London . . .	100 0 0	6 10 0	197–202
10798	50	Grand Junction .	50 0 0	5 0 0	109–112
5840	25	Do., ¼ shares . .	25 0 0	5 0 0	54–56
6160	25	Do., new ditto; max. div., 7½ p.c.	25 0 0	5 0 0	40–45
555180	100	Kent	100 0 0	8 0 0	280–285
781800	100	Lambeth	100 0 0	6 10 0	203–206
326150	100	Do., max., 7½ p.c.	100 0 0	6 10 0	170–175
442	100	New River	100 0 0	10 3 8	360–370
4475	100	Do.	85 0 0	10 3 8	280–300
400000	100	Do., deb. sk., 4p.c.	100 0 0	4 0 0	101–103
666800	100	Southwrk & Vauxh.	100 0 0	6 0 0	205–210
324700	100	Do., pref. stock .	100 0 0	5 0 0	120–125
126560	100	Do., D shares. .	100 0 0	6 0 0	170–175
700007.	100	Do., new ordnry.	..	4 10 0	..
1600	100	Do., nw. ord. No. 1	40 0 0	4 10 0	..
15073	61	West Middlesex .	61 0 0	6l. p.sh.	168–173

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

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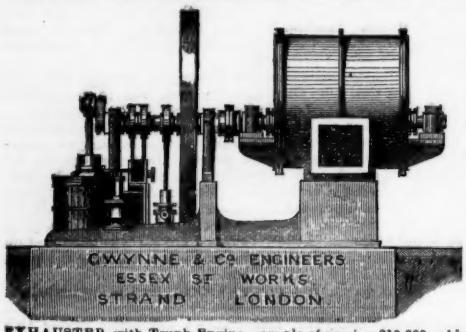

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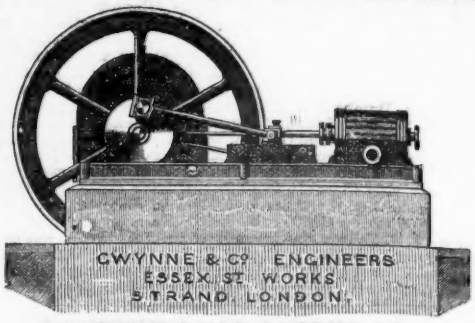
The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



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GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

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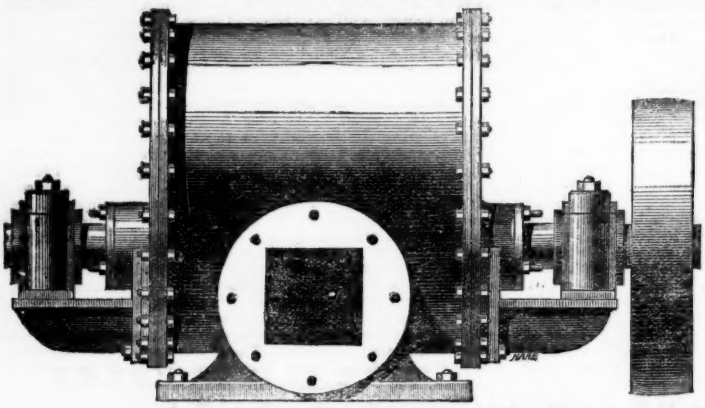

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WANTED, Readers of the NEW Edition, "Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Assoc.M.I.C.E., Gas-Works, SYDENHAM.

WANTED, a Situation as Working MANAGER or FOREMAN of a Gas-Works. Thoroughly understands the Manufacture and Distribution of Gas, and Main and Service Laying, Meter Fixing, and Index Taking, &c., and Fitting in all departments.
Address No. 639, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a person to work a Sulphate of Ammonia Apparatus. One acquainted with working on the Tower principle preferred.
Apply, by letter, stating experience and wages, &c., to No. 647, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Partner in an old established Gas-Meter Manufactory. Capital required from £1000 to £2000.
For particulars apply to Messrs. BUCKLEY & MATTINSON, Solicitors, Church Lane, OLDHAM.

TO STOKERS.

WANTED, a steady Sober Man as STOKER, and to make himself useful, at the Bognor Gas-Works.
Apply, by letter, with references as to ability and character, stating age, and whether married or single, to WM. HAMMOND, Manager and Secretary.

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IMPORTANT TO SMALL CAPITALISTS AND WORKING GAS MANAGERS.
SMALL GAS-WORKS FOR SALE OR TO BE LET.

TO BE SOLD (or will be Let for a term of years) the Tramore Gas-Works, held in Fee Simple. Gross rates under £5 a year.
For particulars apply to WILLIAM REA, WATERFORD, or ISAAC THORNTON, Solicitor, WATERFORD.

DRAUGHTSMAN, experienced hand required for a large Gas-Works in the Provinces.
Apply, by letter, stating salary required and references, to No. 645, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOREMAN Wanted, to superintend Main and Service Laying. Must have a practical knowledge of the work, and be well acquainted with Gas-Fittings, Meters, &c. Age about 30.
Apply in own handwriting, with references, to No. 646, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

AN Engineering Firm has several valuable Commissions for an AGENT visiting the Gas-Works of the larger towns.
Address, with full particulars, which will be treated confidentially, No. 649, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS-FITTERS, BRASS FINISHERS, AND FOREMAN PIPE LAYERS.

THE Bangor Local Board require a Competent GAS-FITTER and BRASS-FINISHER; also a Competent Person to take the charge of some Pipe-Laying, both for Gas and Water.
Applications to be made in own handwriting, accompanied with testimonials as to qualification and character, addressed to Mr. A. Upward, 8, Queen Anne's Gate, Westminster, S.W., on or before April 19, 1880.
By order,
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AMMONIACAL LIQUOR.

THE Best Continuous Method for Working Large or Small Quantities of Liquor. This is an improvement on what is known as the "Coffey Still Process." The result in sulphate of ammonia is very large, nearly every atom of ammonia gas being driven out of the liquor before it is liberated, also a saving in acid. Small Working Models to work about 5 gallons per day, with steam boiler and every requisite, sent c.o.d., carriage paid, price £4 4s. Also improved (and, if required, continuous) method of Working Liquor Ammonia from Gas Liquor.
Address JOHN G. HARVEY, Milnsbridge, HUDDERSFIELD.

BATH GASLIGHT AND COKE COMPANY.

TO GAS ENGINEERS.

THE appointment of Engineer to the above Company will be vacant on the 1st of July next.
The Directors are therefore open to receive applications for the same not later than May 4, to be addressed to the CHAIRMAN of the Company, stating qualifications, age, salary required, references, &c.
A residence is provided.
Offices, Upper Bristol Road, Bath, April 2, 1880.

FOR SALE—The Lease of two Small Gas-Works, paying well, and in good working order.
Address No. 648, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—Gas Governors of very substantial construction on unusually favourable terms.
Particulars on application to the IMPERIAL METER COMPANY, LIMITED, King's Road, ST. PANCRAS, N.W.

ON SALE, at the Manchester Corporation Gas-Works, a STATION-METER made by Crossley, of London, and capable of passing about 30,000 cubic feet per hour.
Further particulars upon application to Mr. GEORGE B. JACKSON, Town Hall, MANCHESTER.

THE Sunbury-on-Thames Gas Company have FOR SALE the following PLANT, in good condition, thrown out to give place to larger:—
Two Purifiers, 5 ft. by 3 ft. by 3 ft. deep.
Six-inch Connections with Lifting Screw and Traveller complete.
Three 6-in. Cathels's patent Four-way Valves.
Station-Meter to pass 1500 feet per hour, 4-in. Connections.
Five-inch Condenser, nine Pipes, and Tar Box with Overflow Pipe.
Six 6-in. Donkin's Valves.
For particulars and price apply to Mr. JOHN SMITH, Manager, Gas-Works, Sunbury-on-Thames, MIDDLESEX.

THE "Phare" Gas-Burner and Lantern, as described in the JOURNAL for March 30. 150-Candle Power. Price complete in Bronze, £15; Iron, £10. Agents wanted.

Apply to KILLINGWORTH HEDGES, C.E., 25, Queen Anne's Gate, WESTMINSTER.

THE Gloucester Gas Company, ceasing to manufacture gas at their old works, will have the undermentioned APPARATUS for Sale about the beginning of August, viz.:—

About 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12-in. Slide-Valves and 12-in. Connections.

Scrubber (round), 5 ft. by 20 ft., with three 12-in. Slide-Valves, and 12-in. Connections.

Exhauster (Jones) to pass about 15,000 feet per hour.

Exhauster (Beales) to pass about 25,000 feet per hour.

Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shafting used for driving the above.

Boiler 14 ft. 6 in. by 8 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.

4-horse power Horizontal Steam-Engine.

Three 4-in. Pumps, with cranked Shafting and a pair of Mitre Wheels.

Two Purifiers, 16 ft. by 8 ft., with six 12-in. Slide-Valves and 12-in. Connections.

Station-Meter by A. Wright and Co., London, with three 12-in. Slide-Valves, and 12-in. Bye-Pass and Connections, to pass about 25,000 feet per hour.

Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.

Gasholder, Double Lift, capacity 100,000 feet.

Gasholder, Double Lift, capacity 240,000 feet.

One 12-in. Governor, by Wright, London, with 12-in. Valves, Bye-Pass, and Connections.

Two 12-in. four-way faced Valves, by Cockey.

For further information, &c., apply to the undersigned.

R. MORLAND, Engineer.

THE Sheffield United Gaslight Company OFFER for SALE the following lots of Retort-House FITTINGS, which they are now taking down at two of their Stations:—

54 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft. 6 in. by 18 in. by 18 in.
16 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft. 6 in. by 18 in. by 15 in.
4 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft. 6 in. by 16 in. by 15 in.
320 Cast-Iron Mouthpieces, D-shaped, 21 in. by 15 in.
160 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 7 ft. 6 in. long.
215 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 5 ft. 6 in. long.
50 Lengths 4-in. Cast-Iron Ascension-Pipes, curved, 5 ft. 6 in. long.
60 Lengths 4-in. Cast-Iron Ascension-Pipes, curved, 2 ft. 8 in.
37 Lengths 4-in. Cast-Iron Ascension-Pipes, curved, 10 ft. 2 in.
40 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 5 ft. 10 in.
17 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 5 ft. 5 in.
481 Lengths 4-in. Cast-Iron H-Pipes.
506 Lengths 4-in. Cast-Iron Dip-Pipes.

The above apparatus has been in use up to a recent date, and is adapted for re-erection.

The Company will be prepared to receive an offer for the whole or any portion of the above. Price £4 per ton, loaded into trucks at Sheffield.

Applications to be addressed to the undersigned.

THOS. ROBERTS, Manager.

Gas Office, Sheffield, March 25, 1880.

TO BUILDERS AND CONTRACTORS.

THE Directors of the Newmarket Gas-light and Coke Company are prepared to receive TENDERS for the Excavation and Construction of a Concrete TANK, for a Gasholder on the Company's premises.

Plans and specifications may be seen upon application to the undersigned, to whom tenders are to be sent on or before the 19th of April inst.

The Directors do not bind themselves to accept the lowest or any tender.

No allowance for tenders.

By order,

THOMAS WILKINSON, Manager and Secretary.

Gas-Works Office, Newmarket, Cambs,
April 2, 1880.

TO GASHOLDER MAKERS.

THE Directors of the Newmarket Gas-light and Coke Company are prepared to receive TENDERS for the Construction and Erection of a Telescopic GASHOLDER.

Plans and specifications may be seen upon application to the undersigned, to whom tenders are to be sent on or before the 26th of April inst.

The Directors do not bind themselves to accept the lowest or any tender.

By order,

THOMAS WILKINSON, Manager and Secretary.

Gas-Works Office, Newmarket, Cambs,
April 2, 1880.

MANCHESTER CORPORATION GAS-WORKS.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Gas Committee will receive, not later than Tuesday, the 20th of April next, TENDERS of CANNEL and COAL for delivery at their Works, situated at Gaythorn and Rochdale Road, during a period commencing from the 1st of July next (tenders for three or five years will have the preference), and the Committee are now prepared to receive applications for permission to send in samples.

Sealed tenders, stating price and quantity proposed to be delivered at each station and the rate and period of delivery, and endorsed "Tender for Cannel" or "Tender for Coal," as the case may be, must be addressed to the Chairman of the Gas Committee, and delivered at this Office.

The Committee do not bind themselves to accept the lowest or any tender.

By order,

JOSEPH HERON, Town Clerk.

Gas Department, Town Hall, March 25, 1880.

WALTHAM ABBEY AND CHESHUNT GAS COMPANY.

TO GASHOLDER MAKERS.

THE Directors of the above Company require TENDERS for the erection of a TELESCOPE GASHOLDER to contain 130,000 cubic feet.

Drawings and specification may be seen upon application to Mr. Corbet Woodall, the Gas-Works, Vauxhall Bridge, S.E.

Tenders, addressed to the Chairman, Gas-Works, Waltham Cross, are to be delivered before noon on Friday, April 9.

The Directors do not bind themselves to accept the lowest or any tender.

HUBERT GOUGH, Secretary.

GASHOLDER-TANK.

THE Directors of the Lancaster Gas Com-pany are desirous of receiving TENDERS for the Construction of a Brick TANK, 132 ft. diameter by 30 ft. deep, at their works, Lancaster.

Plans and specifications may be seen at my Office, St. George's Quay here, on and after Monday, the 12th inst.

Tenders to be sent in under cover, marked "Tender," addressed to Mr. ROPER, Chairman, not later than Tuesday, the 27th inst.

The Directors do not bind themselves to accept the lowest or any tender.

WM. FLEMING, Engineer and Manager.

Lancaster, April 2, 1880.

MACCLESFIELD CORPORATION GAS-WORKS.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee are prepared to receive TENDERS for the Purchase of the Surplus TAR and AMMONIACAL LIQUOR made at their Works during the Twelve months commencing on the 1st of May ensuing.

Tenders to be sent in not later than April 10, addressed to the Chairman of the Gas Committee, Town Hall, Macclesfield, and endorsed "Tender for Tar," &c.

For conditions of contract apply to

THOMAS MOORE, Engineer and Manager.

Gas-Works, March 29, 1880.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Bristol United Gas-light Company are ready to receive TENDERS for the Purchase of TAR produced at each of their Stations, situated respectively at Avon Street, Canons Marsh, and Stapleton Road, from Jan. 1, 1881.

The approximate quantity of Tar made annually at each station will be—at Avon Street, 500,000 gallons; Canons Marsh, 350,000 gallons; Stapleton Road, 100,000 gallons.

Tenders to be for Three or Five years, but contracts will not be taken for a longer term than five years.

The terms and conditions of the contract may be known on application to the Secretary, at the Office of the Company, Canons Marsh, Bristol.

Tenders, sealed and marked "Tenders for Tar," must be delivered not later than Tuesday, May 4, 1880.

The Directors do not bind themselves to accept the highest or any tender.

By orders of the Directors,

HENRY H. TOWNSEND, Secretary.

SECOND-HAND ENGINES, EXHAUSTERS, BOILERS, &c.

THE Scarborough Gas Company invite OFFERS for the Purchase of their present Duplicate Exhausting Machinery, comprising Two 7-in. Cylinder by 14-in. Stroke Horizontal Steam-Engines; Two 20,000 cubic feet per hour Gwynne and Beale's Patent Exhausters; Two Hydraulic Governors in Connection with Throttle Valves of Engines; and Two Cornish Boilers, 11 ft. by 3 ft. 9 in.

The whole are of superior make and have been carefully used, and are well worth attention, being about to be removed for replacement by larger and more powerful apparatus.

The machinery may be seen in operation until the 30th of April, and further particulars may be obtained on application to the undersigned.

By order,

WILLIAM J. MOON, Manager.

Scarborough, March 5, 1880.

GAS COAL.

THE MIRFIELD COAL COMPANY are supplying GAS COAL of the best quality on trucks at their siding. This Coal contains 10 per cent. of Cannel, and, as analyzed by Mr. James Paterson, of Warrington, yields 12 600 *cubic feet of* 16·67-*candle gas, with* 1430 *lbs. of good Coke, per ton.* Ash in Coke, 1·88.

Apply to the MIRFIELD COLLIERY, Mirfield, NORMANTON.

London Agent: Mr. F. J LEE SMITH, 33 THROGMORTON ST.

Imperial METER COMPY.

LIMITED,

Makers of THE IMPROVED DRY GAS-METERS, THE PATENT WET GAS-METERS, Special Meters for Public Lighting, STATION-METERS, Governors, &c.

KING'S ROAD, ST. PANCRAS.

Formerly also (Walter Ford) at Gray's Inn Road.

S. PONTIFEX & CO.,

GAS AND WATER ENGINEERS,

22, COLEMAN STREET, LONDON, E.C.,

Supply and Erect Street Lamp Columns, together with Head Irons and Lanterns, as well as all the other fitting connected therewith.

S. P. & Co. also contract with Gas, Railway, and other Companies, Local Boards, and Vestries, for the maintenance and repair of Lamps and Fittings.

CORPORATION OF NOTTINGHAM.—GAS DEPARTMENT.

TENDERS FOR COALS.

THE Gas Committee are desirous to receive OFFERS for supplies (amounting in the aggregate to 100,000 tons) of SOFT COALS and SOFT COBBLES or NUTS, for the period terminating on the 30th of April, 1881.

The Large Coals and the Cobbles or Nuts are to be separately delivered, where and as from time to time directed, by and at the expense of the Contractors, upon the Gas-Works Siding, Great Northern Railway, in the East Croft, at Nottingham, and at the Midland Company's Railway Station, at Nottingham, and also on the Gas-Works Sidings, Midland Railway, at Radford and Basford respectively; and at and after the rate of one-eighth part of such total quantity in each calendar month, commencing with the month of July next, till the Corporation shall be satisfied with the amount of accumulated stock, and afterwards at such rate as shall be from time to time directed, till the agreed quantity shall have been delivered.

The Corporation will undertake to receive from each person or firm whose tender may be accepted, a total quantity of 5000 Tons at the least; but they do not bind themselves to accept the lowest or other tender or tenders, till after a satisfactory trial of the Coals and Cobbles or Nuts, to which such tender or tenders may relate, shall have been made. They are to be the best of their kind, *well screened*, and as free as possible from sulphur, bats, bind, refuse, and dirt, and shall be weighed (20 cwt. to the ton) upon the Corporation machines, or upon such other machines as may be mutually agreed upon.

Payments will be made monthly, if and so long as the contract shall be duly fulfilled, to the extent of nine-tenths of the amount of the verified invoices, and the balance will be discharged on the satisfactory completion of the contract.

Further information, and forms on which the tenders must be made, may be obtained on application to Mr. John Wilson, the General Manager, at the Gas Offices; and the tenders (sealed), specifying the description of Coals and the pits at which they are to be raised, and stating the prices for deliveries at the several places, and in manner and subject to the conditions aforesaid, must be delivered to Samuel George Johnson, Esq., Town Clerk, on or before Saturday, the 1st day of May next.

By order,

M. OGLE TARBOTTON, Borough Engineer.

Corporation Gas Offices, George Street,
Nottingham, April 1, 1880.

CORPORATION OF LEICESTER.

GAS AND WATER DEPARTMENTS;

FLORAL HALL, LEICESTER,

APRIL 12 *to* 17 *inclusive*, 1880.

EXHIBITION of GAS COOKING AND HEATING STOVES, GAS-ENGINES, BURNERS, and other Appliances and Inventions, showing the advantageous and economical use of GAS and WATER for Domestic and Manufacturing Purposes.

Hours, 11 *a.m. to* 9.30 *p.m.*

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TICKETS FOR THE WEEK, NOT TRANSFERABLE, 2s. 6D. EACH.

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CAST-IRON PIPES

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GAS, WATER, & STEAM.

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MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

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(JULY to DECEMBER, 1879,)

OF THE

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WATER SUPPLY, AND SANITARY IMPROVEMENT.

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Gas-Works Surveys made and Quotations free of charge.

Explosion risk accepted. Rates recently reduced.

NOTICE TO MANAGERS OF GAS COMPANIES.

THE LAW UNION FIRE AND LIFE INSURANCE COMPANY, of No. 126, Chancery Lane, London, grants Policies of Insurance on Gas-Works, and Buildings connected therewith, which cover risk of explosion and spontaneous ignition of Coal, on very advantageous terms. Full particulars will be sent post free on application to

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With 22 Illustrations of Retorts, Purifiers, &c., &c.

Re-written and enlarged, with a chapter on the "Purification of Gas," by Mr. R. H. PATTERSON, late Metropolitan Gas Referee.

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REMARKS on the Rating of Gas and Water Works and on the Principles of Compensation involved in the Transfer of Water Undertakings from PRIVATE to PUBLIC AUTHORITIES, with an Addendum relative to the proposed Transfer of the Metropolitan Water Companies to a Public Trust. By JOSEPH QUICK, Jun., M. Inst. C.E.

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Enamelled Sheet Glass, Flint and Opal, 1s. 2d. Coloured Glass and Opal, 1s. 6d. to 2s. 6d. per foot.

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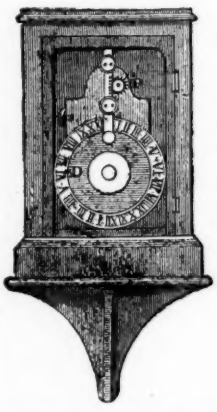

This Instrument has been invented particularly for recording the hours of starting and return of Lamplighters from the Works, or any office, for the discharge of the duties of lighting and extinguishing Public Lamps; but it is also applicable to any establishment in which it is desired to obtain an unfailing record of the attendance or non-attendance of men at their posts at certain periods. Irregularity in the time of lighting Public Lamps leads to complaints, while neglect in extinguishing at the proper hour causes loss to Gas Companies, or where the average meter system is in use, an excess of expenditure on the part of Local Authorities.

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Has a fine gloss, and is very durable.
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Yielding (as per analysis) 11,970 cubic feet of 16·39 candle gas per ton. Copies of analyses and testimonials from **Gas Companies** and **Managers**, who have used the Coal in large quantities for several years, will be forwarded on application.

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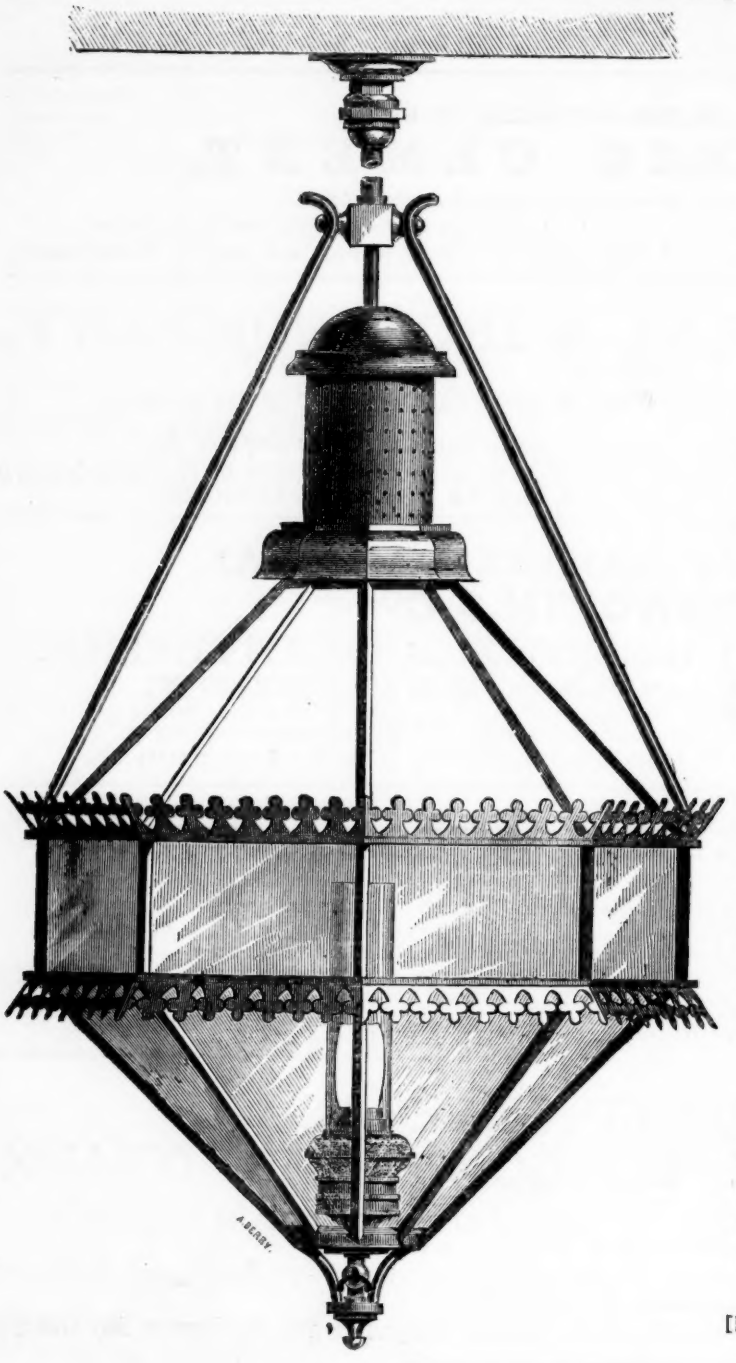
NEW OCTAGON PATTERN LANTERN

For LONDON ARGAND BURNERS of 50 to 400 Candle Illuminating Power, as supplied to the Metropolitan Railway Stations.

Suitable as Columns or Suspension Lights.



Notwithstanding the various statements that have been assiduously circulated of late, tending to prejudice Public Companies, Corporations, and Vestries against the recognized superiority of my large Argand Burners (established by tests made by eminent scientists, and confirmed by testimonials received from numerous Engineers of Gas-Works, which have appeared from time to time in the Advertisements of the JOURNAL), **the Highest Results** obtained at the recent trial of large Burners for Street Illumination held at Birmingham—where the most complete collection of large Burners and Lanterns extant had been assembled—were produced by the **200-candle and other large Argand Burners of my make;** clearly substantiating the statement I have repeatedly published, that the **"Sugg" Burners give over 30 per cent. Illuminating Power more than can be obtained from any other Burners with the like quantity and quality of Gas.**

It remains, moreover, to be mentioned that at the same trial my **Flat-Flame Burner,** with patent circular slit (patented 1875), produced the highest result in illuminating power of all the competitive Flat-Flame Burners present.

[For Extract referred to above, see opposite page.]

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VINCENT WORKS, VINCENT STREET, WESTMINSTER, S.W.

Extract from the JOURNAL OF GAS LIGHTING, &c., *March* 16, 1880.

EXPERIMENTS IN IMPROVED STREET LIGHTING AT BIRMINGHAM.

PUBLIC TRIAL, WEDNESDAY, MARCH 10, 1880.

After a prolonged inspection of the various Lanterns and Burners, tests were made, by a shadow meter, between Sugg's 200-candle Argand (No. 9), Bray's 200-candle Quadruple Bat's-wing (No. 10), and the Burner and Lantern as used by the Paris Gas Company in the Rue du Quatre Septembre (No. 12), with the results as shown in diagram, Fig. 2. These appear to agree pretty nearly with the photometrical results obtained from each burner, as shown in the preceding table (Mr. Hunt's Experiments, see page 404 of JOURNAL OF GAS LIGHTING, March 16, 1880).

PHOTOMETRICAL TRIALS.

No. 9. *Sugg's 200-candle Argand Opal Top, Consumption per hour 44 cubic feet.*	*No. 10.* *Bray's 200-Candle Quadruple Bat's-wing, Consumption per hour 50 cubic feet.*	*No. 12.* *Burner and Lantern used by the Paris Gas Company in the Rue du Quatre Septembre, Consumption per hour 32 cubic feet.*
Light equal.		*Light equal.*
79·5 feet	70·5 feet	85 feet — 65 feet
150 feet		150 feet

Fig. 2.

NOTE.—The Lights were fixed on Posts in the manner they are used in the Public Streets.

THE RESULTS WORK OUT AS FOLLOWS:—

No. 9.	No. 10.	No. 12.
27 per cent. better than No. 10. = 191·7 Candles. Add 24·0 Candles for the extra 6 ft. of gas required to equal consumption of No. 10.	= 151 Candles, or 8 per cent. better than No. 12.	= 92·8 Candles. If the consumption had been 50 ft., the Illuminating Power would have been at the same rate—138 Candles.

Total 215·7 Candles, or 42 per cent. better than No. 10 for the same quantity of Gas.

The next best on the List is Sugg's 100-Candle Argand Burner, as adopted for the Refuges by the Vestry of Lambeth, and many Towns in England, and on the Continent of Europe, America, Australia, &c., &c.

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WET AND DRY GAS-METER MANUFACTURERS.

STATION-METERS, PRESSURE-GAUGES, &c., of the Highest Excellence only.

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ATHERTON COLLIERIES, near MANCHESTER,

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CANNEL AND OF THEIR **ARLEY MINE GAS COAL,**

WHICH ARE OF ACKNOWLEDGED EXCELLENCE.

Their Coal is in use in the Salford, Stafford, Bolton, and other large Gas-Works in England, Ireland, Wales, and Abroad, giving in practical working 10,300 feet of 17-candle Gas, and 15 cwt. of superior Coke per Ton of Coal.

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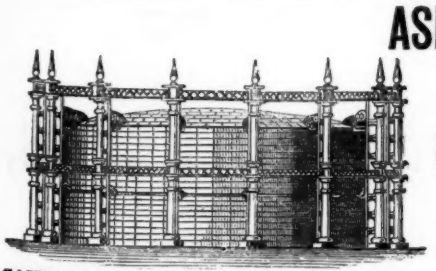
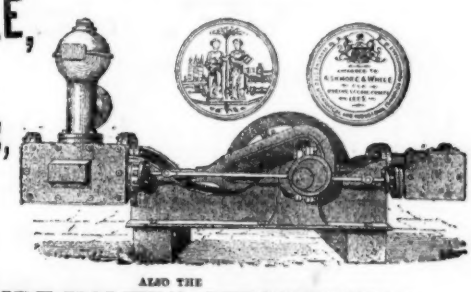


HOPE IRON-WORKS,

STOCKTON-ON-TEES,

ENGINEERS

AND MAKERS OF



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ROOFS	. .	52 Erections.
BRIDGES & GIRDERS . .	. .	250 "
BOILERS.	. .	43 "
PURIFIERS & SCRUBBERS. .	. .	115 "

ALSO THE

"SLIDE-VALVE" STEAM-PUMP,

For Water, Tar, Grains, Soap, Thick Fluids, Chemical, Gas, or Iron Works, Mines, Breweries, Ships, &c. No possibility of Valves sticking, as they are actuated by positive motion from an eccentric.

References to Forty-five Users.

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"WARNER & COWAN" METER.

THIS Meter stands alone and unrivalled, as the only thoroughly reliable, and continuously accurate, measurer of gas.

The drum is properly described as "self-regulating," its construction being such that it maintains practical uniformity of discharge per revolution throughout all changes of water-line.

All other Wet Meters either vary with a varying water-line (because their drums are *not* self-regulating), or are complicated by "compensating" arrangements in the futile and *now wholly superfluous attempt* to make the water-line unvarying.

Loss of water by evaporation or otherwise, neglect to supply it at the proper time, or to the correct degree (so necessary for the registration of other Meters), produces no change in the measurement of the WARNER & COWAN. Even in the extreme case of a prolonged neglect to water leading to the extinction of the lights, nothing but inconvenience would arise; whereas with an ordinary Wet Meter this inconvenience would, in such a case, not only occur (and much sooner, because of the shorter range of float), but would be preceded by a considerable alteration of capacity, and therefore incorrect registration.

"Compensating" Meters, depending as they all do upon complex arrangements (extraneous to the drum), for maintaining the water-line, are not only inadequate to the duty, but unreliable in action.

The drum of a Meter being the measurer, ought to be *in itself* a true and unvarying measure. This, the WARNER & COWAN drum *alone* is.

W. & B. COWAN,

(ESTABLISHED 1827,)

WET & DRY GAS-METER MANUFACTURERS,

Sole Licensees and Manufacturers of

THE AUTOMATIC PRESSURE CHANGER,

[WM. COWAN'S PATENT.]

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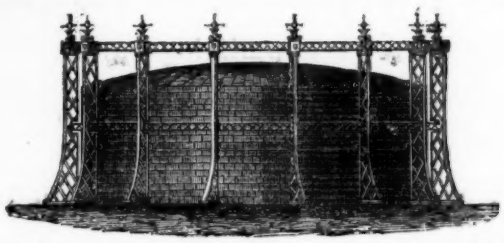
CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.



THE HORSELEY COMPANY,

LIMITED,

TIPTON, STAFFORDSHIRE.

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AND ALL REQUISITES FOR EITHER

GAS OR WATER WORKS;

ALSO

MAKERS OF ROOFS, BRIDGES, &c.

S. OWENS & CO.,

WHITEFRIARS STREET, FLEET STREET, LONDON, E.C.,

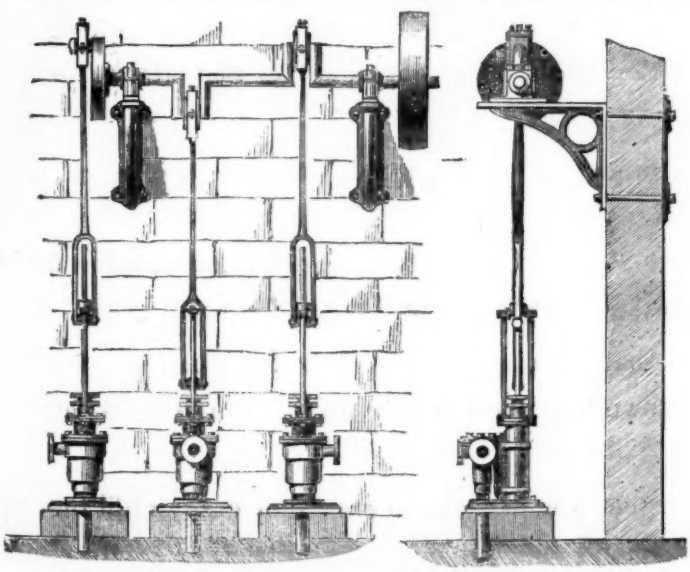
Hydraulic Engineers,

AND MANUFACTURERS OF

PUMPING MACHINERY of every Description.

SOLE LICENSEES AND MANUFACTURERS FOR GREAT BRITAIN OF

BLAKE'S PATENT DIRECT-ACTING STEAM-PUMPS.



IMPROVED DOUBLE-ACTION PUMPS.

For Water. For Tar. For Ammoniacal Liquor.

This illustration shows an arrangement of three (No. 179) Improved Double-Action Pumps driven from the same crank-shaft, as frequently supplied for use in Gas and Chemical Works. The suction and discharge pipes can be arranged for drawing from and delivering in any required direction

These Pumps have been supplied to nearly all the large Gas Companies and Chemical Works, both for Pumping Water, Tar, and Ammoniacal Liquor.

GAS SYPHON PUMPS, IN COPPER OR SHEET IRON, ALWAYS IN STOCK.

Illustrated Catalogues sent post free on application.

WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

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WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,

Manufacture and keep in stock at their works (also a large stock in London) PIPES and CONNECTIONS 1½ to 48 inches in diameter; and make to order Retorts, Purifiers, and Tanks, with or without planed joints, Columns, Girders, Special Castings, required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Syphons and Covers are joint-faced if required, doing away with millboard and iron boring, or Syphons made without Covers, a socket being cast on and fitted with a small plug about 6 inches in diameter with lead joint. In either way preventing leakage.

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WORKS:

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These celebrated Paints are now very generally acknowledged to be the best and most economical in use. GAS COMPANIES especially have, by experience, proved that no others so fully meet their peculiar requirements, as they are not only UNAFFECTED BY GREAT HEAT and EFFECTUALLY RESIST SULPHURETTED HYDROGEN, AMMONIA, &c., &c., but they may be applied to GASHOLDERS that have hitherto been covered with the unsightly coal tar.

They are also cheaper than other paints and compositions; TWO COATS OF GENUINE WOLSTON'S TORBAY PAINT BEING EQUAL IN COVERING POWER TO THREE OF LEAD PAINT, or any of the numerous low-priced spurious oxides that are now in the market, whilst the durability of Wolston's is unrivalled.

The colours most approved for GASHOLDERS, PURIFIERS, SCRUBBERS, and all the plant and machinery used in and about Gas-Works, are—

FOR DARK TINTS.

No.	p. Cwt.	No.	p. Cwt.
13. Torbay Red	34s.	8. Bronze Green	36s.
6. Dart Brown	34s.	16. Torbay Chocolate	34s.
10. Carriage Red	34s.	4. Brixham Black	32s.
1. Torbay Brown	30s.		

FOR LIGHT TINTS.

No.	p. Cwt.	No.	p. Cwt.
7. Imperial Stone	34s.	19. Light Stone	38s.
29. Portland Stone	38s.	30. Bath Stone	38s.
31. Gray Stone	38s.	38. Buff	35s.

These Prices are for Paints in paste, carriage paid to any Gas-Works in Great Britain, in consignments of not less than 5 cwt.; but all the above colours may be had, READY MIXED FOR THE BRUSH, IN VARIOUS SIZED PAINT CANS WITH HANDLES, AT A UNIFORM PRICE OF 56s. PER CWT. (6d. PER LB.) carriage paid as above, in consignments of not less than 2 cwt., the sizes being 3 lb., 7 lb., 14 lb., and 28 lb. By taking the Paints in this convenient form, a considerable saving is effected in time, &c., as they can be immediately applied by any workman without the intervention of skilled painters to mix and prepare them; besides which all waste is avoided, and they may always be relied on as containing no adulterating or inferior material.

Where light colours are preferred, the work should be primed with two coats of No. 7, and finished with either of the other stone colours; and when the darker colours are selected, a priming coat of No. 13 is recommended.

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THE

MANN & WALKERS' PATENT SCRUBBER.

Extensive use.

The successful and extensive use of the Mann and Walkers' Patent Scrubbers in all parts of the world has demonstrated their advantages, and entitled them to be received with credit and confidence. The number of them in use is about twenty times that of any other known means of purifying gas from ammonia.

Small quantity of Water required.

By a very small quantity of clean water (not more than 5 or 6 gallons per ton of coals carbonized) the whole of the Ammonia contained in the Gas is completely absorbed; the Gas, after only once passing through, issuing from the Scrubber outlet completely purified from Ammonia. The Scrubber gives no appreciable back pressure.

Residual Product obtained.

The Residual Product—namely, the Ammoniacal Liquor—is obtained at from 20 to 30 ounces commercial strength, which enables it, after being mixed with the weaker Liquor from the hydraulic main and condensers, to be sold to the Manufacturing Chemists, or converted into Sulphate, at the degree of strength found most profitable to the Gas Company.

Illuminating power increased.

The Scrubber is a Saturator, and the Gas being soaked in this strong solution of Ammonia in the lower columns of the Scrubber, is purified from a large amount of Carbonic Acid, and its Illuminating Power is thereby increased.

Small amount of power required.

The friction is so little, and the motion so slow, that the power necessary to work the Scrubber is almost inappreciable. A small gas-engine will work a pair of Scrubbers, purifying 2 million cubic feet of gas per day.

Beckton Gas-Works.

There are thirty of these Patent Scrubbers in the Beckton Gas-Works, equal to purifying 30 million cubic feet per day, and the total amount of engine power necessary to work the whole 30 is not equal to that given out by one 10-horse engine.

Reserve purifying power contained.

There is also a most important advantage arising from the height of these Scrubbers, in the reserve force contained in them. In the event of any stoppage, the mass of soaked and wetted material would continue the purification for hours, even if the supply of water and working were stopped from any cause.

Internal Materials not changed.

The changing of the soaking materials in these Scrubbers is very seldom required; they are well known to remain in action for seven years without being emptied.

Guarantee.

They are in all cases erected under guarantees; they easily fulfil the stipulations of any Act of Parliament, and the chemical restrictions of the Board of Trade; and in cost they are much less to a Gas Company than any other known means of purifying Gas from Ammonia.

C. & W. WALKER.

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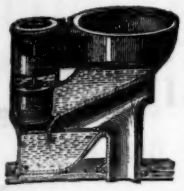

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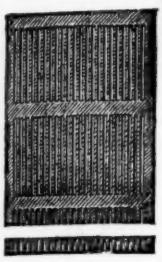

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SCRUBBERS FILLED WITH BOARDS,
On our approved principle, for the extraction of Ammonia.
Prices on application. References to First-Class Engineers.
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The last-named Machine (without the Pulveriser) makes the best and most durable Coke Breaker.

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A STOVE FOR
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12,130 cubic feet of 40·32-candle gas per ton, and 9 cwts. of good coke.

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Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

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Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash. This cannel is almost free from sulphur.

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This Coal is now highly approved of for gas making, and yields over 10,000 feet per ton of 15-candle gas, and about 14 cwt. coke.

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THE Tawd Vale Colliery Company, Limited, are prepared to Contract for the Supply of their superior Arley and other GAS COALS, and to send samples to the order of Gas Engineers and others, or complete Analysis, on application. Shipped at Liverpool, Preston, Fleetwood, Garston, or Birkenhead.

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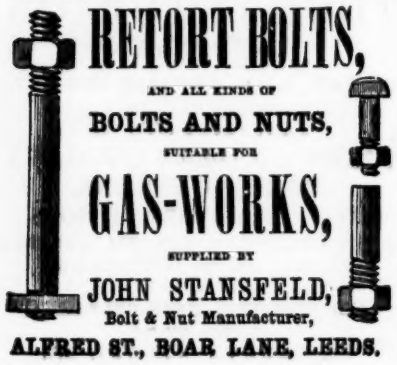

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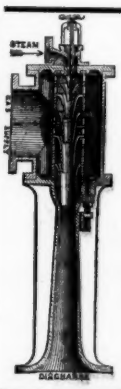

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MARQUESS OF LONDONDERRY'S COLLIERIES.

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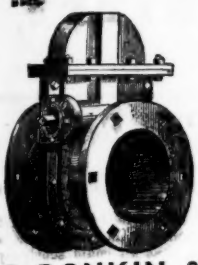
WITH WROUGHT-IRON PINIONS.



These Valves are proved on both sides to 30 lbs. on the square inch before leaving the works, and are kept in stock.

In ordering Valves, please state whether required for under or above ground, and if to be with flanges or spigots and sockets cast on, or with separate spigot and socket pieces.

Also Sole Makers of

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STEAM-ENGINES FOR DRIVING GAS EXHAUSTERS, VALVES FOR AMMONIACAL LIQUOR, IMPROVED BRIDGE VALVES FOR REGULATING THE SEAL IN HYDRAULIC MAINS, BYE-PASS VALVES, SCREW WATER-VALVES, &c.

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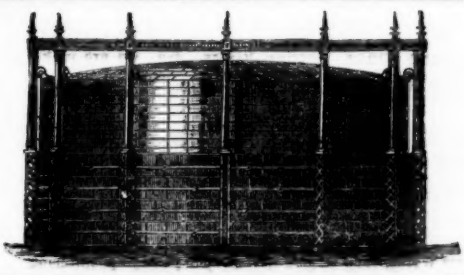

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H. B. & Co. undertake Contracts for the Supply and Erection of Gas-Works, either for Towns or Mansions, or the Remodelling of existing Works.

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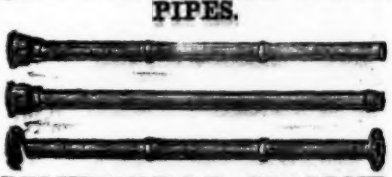

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THE PORTER-CLARK PROCESS

FOR THE

SOFTENING AND FILTRATION OF WATER IN LARGE QUANTITIES, WITHIN SMALL SPACE, AT SMALL COST.

(*See* JOURNAL *of Jan. 6*, 1880.)

In an article upon the Swindon Water Supply, the *Wilts and Gloucestershire Standard* of Aug. 9, 1879, says:—

"All praise is due to the Company who have thus provided a water supply that, if it can be equalled, we are safe in saying cannot be surpassed. . . . For the information of all caterers for public health, we explain that the mode of so effectually Purifying and softening the really good and naturally wholesome water is the 'PORTER-CLARK PROCESS.' 'CLARK'S PROCESS' was known to be chemically admirable; the improvements, however, effected by Mr. Porter, mechanically, are curious as they are perfect."

The filtration is exquisite, and everything arrested is removed daily.

The Visiting Justices of the Kent County Asylum at Chartham on Aug. 29, 1879—

Resolved, "That a favourable testimonial be given to Mr. Porter for his system down to the present time, and that the Clerk forward a copy of this resolution to Mr. Porter." (50,000 gallons daily.)

The Visiting Justices of the Middlesex County Asylum, Banstead Downs, under date of Sept. 12, 1879—

Certify, "That up to the present time the 'PORTER-CLARK WATER-SOFTENING PROCESS,' which has been in operation at this Asylum for about two years, has satisfactorily answered the purposes for which it was intended." (60,000 gallons daily.)

(See *The Times*, Aug. 23, 1877, Paper by Mr. F. J. Bramwell, F.R.S., Meeting of British Association, Plymouth.)

The Proprietor of the *Daily Chronicle* and *Lloyd's Weekly News* writes, Sept. 17, 1879—

"The 'PORTER-CLARK WATER-SOFTENING PROCESS,' erected by you at my paper-mill at Sittingbourne, continues to give satisfaction, and I no longer have any trouble with my steam-boilers. I am not yet working the filters up to their full capacity, only softening about 80,000 gallons per 24 hours, whereas I could easily do more than 120,000 gallons. I may add that it only requires one man to attend to the whole operation."

PATENTED BY JOHN HENDERSON PORTER, C.E.,

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DRY GAS-METERS,

PRIZE MEDALS. LONDON, 1851; NEW YORK, 1853; PARIS, 1855.

(INVENTED & PATENTED IN 1844,)

COMBINING ALL THE LATEST IMPROVEMENTS,

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THE GAS-METER COMPANY, LIMITED,

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CIRCULAR TO GAS COMPANIES AND OTHERS.

Stourbridge, Jan., 1880.

DEAR SIRS,—As the time for ordering stock for your general requirements for this year is approaching, we beg to call your attention to the various articles of our manufacture, and to solicit your early commands.

Fire-Clay Gas-Retorts.—As some of our friends appear to prefer these *machine made*, we have arranged to supply machine-made Retorts at same price as hand-made ones. At the same time, although it is to our advantage to supply machine-made, we do not recommend them, for the reason stated to you in our Circular of November, 1878. We have a very large stock of Retorts, all in good condition, and of such an assortment that we could supply any size on receipt of order.

Fire-Bricks and Fire-Clay Settings of all Shapes and Sizes.—We have a large and varied stock, or could make to special design at short notice.

Staffordshire Blue Bricks and Paving Bricks.—We shall be glad to submit prices and samples of these on hearing from you, with specification, and we venture to say our brand in these goods is unsurpassed. Hard Blue Paving Quarries make the best kind of Pavement for Retort-Houses, &c.

Coloured and White Glazed Bricks, Porcelain Baths, Kitchen Sinks, Corner Sinks, &c., we are making a great speciality of, and have no hesitation in saying that our glazed goods are unequalled for soundness of manufacture and purity of colour.

Earthenware Drain-Pipes, Cast-Iron Pipes, Wrought-Iron Tubing.—We should be glad of an opportunity of quoting you for these when you are in the market.

Lime, Cement, Plaster of Paris.—Our Lime Kilns at Brettell Lane are now in full operation, and we are in a position to supply any quantity of pure Lime manufactured only from the Earl of Dudley's best Limestone Beds. Our Cements and Plaster of Paris will withstand any required test.

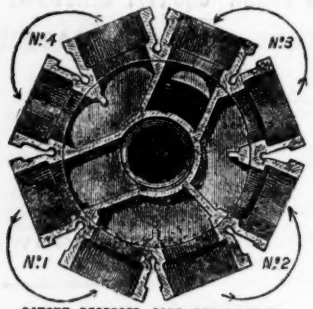
References and Testimonials.—We can furnish you with any number of these; and may mention that during the last thirty-five years we supplied most of the Gas-Works in the United Kingdom and Abroad, and that we have held contracts from Her Majesty's Government for more than Twenty years consecutively.

Awaiting your esteemed favours,

We remain, Dear Sirs, your obedient servants,

HARRIS & PEARSON.

Note.—We shall be pleased to furnish Drawings and Specifications, if desired, and shall be most happy to see you or any of your Engineers here at any time; or, if you would like to see any of our representatives or ourselves at your Works, shall be glad to wait upon you by appointment.



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Sectional Plan.

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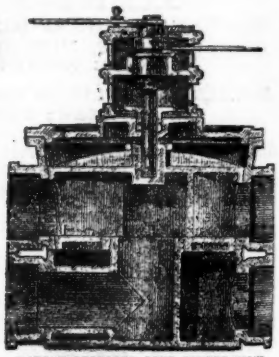

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Which are so constructed that neither putty nor other materials are required to secure the glass. No hacking out of old putty, which frequently destroys the frames. A new pane of glass can be inserted in two or three minutes by any inexperienced person, the glass being secured by a hinged flap and turn button.

PRICE, with Opaline Reflecting Top, 12s.; with Fluted Glass Top, 10s. 6d.
Also made EXTRA STOUT recommended for its durability.

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By the use of which stoppages in service and other pipes are freed from naphthaline and other obstructions in a few minutes. PRICE 73s. net.

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For inserting in mains, to prevent the excess of pressure in high ground, or other elevated positions.

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